

Model	Year	Price	Engine	Transmission	Drivetrain	Options	Notes
Model A	1931	\$1,100	4-cyl	3-sp	2-w	Standard	
Model B	1931	\$1,200	4-cyl	3-sp	2-w	Standard	
Model C	1931	\$1,300	4-cyl	3-sp	2-w	Standard	
Model D	1931	\$1,400	4-cyl	3-sp	2-w	Standard	
Model E	1931	\$1,500	4-cyl	3-sp	2-w	Standard	
Model F	1931	\$1,600	4-cyl	3-sp	2-w	Standard	
Model G	1931	\$1,700	4-cyl	3-sp	2-w	Standard	
Model H	1931	\$1,800	4-cyl	3-sp	2-w	Standard	
Model I	1931	\$1,900	4-cyl	3-sp	2-w	Standard	
Model J	1931	\$2,000	4-cyl	3-sp	2-w	Standard	
Model K	1931	\$2,100	4-cyl	3-sp	2-w	Standard	
Model L	1931	\$2,200	4-cyl	3-sp	2-w	Standard	
Model M	1931	\$2,300	4-cyl	3-sp	2-w	Standard	
Model N	1931	\$2,400	4-cyl	3-sp	2-w	Standard	
Model O	1931	\$2,500	4-cyl	3-sp	2-w	Standard	
Model P	1931	\$2,600	4-cyl	3-sp	2-w	Standard	
Model Q	1931	\$2,700	4-cyl	3-sp	2-w	Standard	
Model R	1931	\$2,800	4-cyl	3-sp	2-w	Standard	
Model S	1931	\$2,900	4-cyl	3-sp	2-w	Standard	
Model T	1931	\$3,000	4-cyl	3-sp	2-w	Standard	
Model U	1931	\$3,100	4-cyl	3-sp	2-w	Standard	
Model V	1931	\$3,200	4-cyl	3-sp	2-w	Standard	
Model W	1931	\$3,300	4-cyl	3-sp	2-w	Standard	
Model X	1931	\$3,400	4-cyl	3-sp	2-w	Standard	
Model Y	1931	\$3,500	4-cyl	3-sp	2-w	Standard	
Model Z	1931	\$3,600	4-cyl	3-sp	2-w	Standard	
Model AA	1931	\$3,700	4-cyl	3-sp	2-w	Standard	
Model AB	1931	\$3,800	4-cyl	3-sp	2-w	Standard	
Model AC	1931	\$3,900	4-cyl	3-sp	2-w	Standard	
Model AD	1931	\$4,000	4-cyl	3-sp	2-w	Standard	
Model AE	1931	\$4,100	4-cyl	3-sp	2-w	Standard	
Model AF	1931	\$4,200	4-cyl	3-sp	2-w	Standard	
Model AG	1931	\$4,300	4-cyl	3-sp	2-w	Standard	
Model AH	1931	\$4,400	4-cyl	3-sp	2-w	Standard	
Model AI	1931	\$4,500	4-cyl	3-sp	2-w	Standard	
Model AJ	1931	\$4,600	4-cyl	3-sp	2-w	Standard	
Model AK	1931	\$4,700	4-cyl	3-sp	2-w	Standard	
Model AL	1931	\$4,800	4-cyl	3-sp	2-w	Standard	
Model AM	1931	\$4,900	4-cyl	3-sp	2-w	Standard	
Model AN	1931	\$5,000	4-cyl	3-sp	2-w	Standard	
Model AO	1931	\$5,100	4-cyl	3-sp	2-w	Standard	
Model AP	1931	\$5,200	4-cyl	3-sp	2-w	Standard	
Model AQ	1931	\$5,300	4-cyl	3-sp	2-w	Standard	
Model AR	1931	\$5,400	4-cyl	3-sp	2-w	Standard	
Model AS	1931	\$5,500	4-cyl	3-sp	2-w	Standard	
Model AT	1931	\$5,600	4-cyl	3-sp	2-w	Standard	
Model AU	1931	\$5,700	4-cyl	3-sp	2-w	Standard	
Model AV	1931	\$5,800	4-cyl	3-sp	2-w	Standard	
Model AW	1931	\$5,900	4-cyl	3-sp	2-w	Standard	
Model AX	1931	\$6,000	4-cyl	3-sp	2-w	Standard	
Model AY	1931	\$6,100	4-cyl	3-sp	2-w	Standard	
Model AZ	1931	\$6,200	4-cyl	3-sp	2-w	Standard	
Model BA	1931	\$6,300	4-cyl	3-sp	2-w	Standard	
Model BB	1931	\$6,400	4-cyl	3-sp	2-w	Standard	
Model BC	1931	\$6,500	4-cyl	3-sp	2-w	Standard	
Model BD	1931	\$6,600	4-cyl	3-sp	2-w	Standard	
Model BE	1931	\$6,700	4-cyl	3-sp	2-w	Standard	
Model BF	1931	\$6,800	4-cyl	3-sp	2-w	Standard	
Model BG	1931	\$6,900	4-cyl	3-sp	2-w	Standard	
Model BH	1931	\$7,000	4-cyl	3-sp	2-w	Standard	
Model BI	1931	\$7,100	4-cyl	3-sp	2-w	Standard	
Model BJ	1931	\$7,200	4-cyl	3-sp	2-w	Standard	
Model BK	1931	\$7,300	4-cyl	3-sp</			

1931 CAR MODELS—EQUIPMENT USED

Page	CAR	Model	Serial No.	Year	Make	BATTERY		Gr. Ter.	Switch Make	LIGHTING						
						Type	Model			Fuses	Breaker	Head	Edison Mazda Lamp Numbers			
													Aux.	Side Dsh.-tail	Stop Dome	
1670	AUBURN	8-98		1931	U.S.L.	XY-15X-6A	Pos.	Sor. Man.	20	*	1110	*	63	63-1158	1158	81
1672	AUSTIN	Bantam		1931	U.S.L.	3-CY-X4X-7A	Neg.	B. & S.	50518	20	*	1110	*	63	*	*
1674	BUICK	8-50		1931	Various		Neg.	Delco-Remy	486-L	*	DR.410-G	1110	*	63	63	87
1676	BUICK	8-60		1931	Various		Neg.	Delco-Remy	486-L	*	DR.410-G	1110	*	63	63	87
1676	BUICK	8-80, 90		1931	Various		Neg.	Delco-Remy	486-L	*	DR.410-G	1110	*	63	63	87
1678	CADILLAC	355	800,001 Up	1931	Delco-Remy	15-CW	Pos.	Delco-Remy	486-H	*	DR.5759	1110	63	*	63	87
1680	CADILLAC	370	1000,001 Up	1931	Exide	3-LXV-15-1R	Pos.	Delco-Remy	486-D	*	DR.5759	1110	63	*	63	87
1682	CADILLAC	452		1931	Exide	3-XCRV-21-2G	Pos.	Delco-Remy	486-H	*	DR.5759	1110	63	*	63	87
1684	CHEVROLET	AE	Independent	1931	Various		Neg.	Delco-Remy	478-E	15	*	1110	63	63	63	87
1686	CHRYSLER	CM	6,520,501 Up	1931	Willard	WS-1-13	Pos.	Clum	9150	20	*	1110	*	63	63-1158	1158
1688	CHRYSLER	CD, CDX		1931	Willard	WS-2-15	Pos.	Clum	9150	20	*	1110	*	63	63	87
1690	CHRYSLER	CG		1931	Willard	SJWR-6	Pos.	Clum	9150	*	DR.410-E	1110	*	63	63	87
1692	CORD	L-29		1931	U.S.L.	XY-15X-6A	Pos.	Sor.Man.	5650-A	*	DR.410-C	1110	*	63	63-87	87
1694	CUNNINGHAM	V-9		1930-31	Willard	SJRR-5	Neg.	Delco-Remy	486-D	10	DR.5759	1129	*	63	63	1129
1696	DE SOTO	CK		1930-31	Willard	WS-1-13	Pos.	Clum	9150	20	*	1110	63	*	63-1158	1158
1698	DE SOTO	SA		1931	Willard	WS-1-13	Pos.	Clum	9150	20	*	1110	*	63	63-1158	1158
1700	DE SOTO	CF		1931	Willard	WSB-15	Pos.	Clum	9150	20	*	1110	*	63	63-1158	1158
1702	DE VAUX	6-75		1931	U.S.L.	3-CVX-6X-6A	Neg.	Clum	10741	20	*	1110	63	*	63-1158	1158
1704	DODGE	DH	3,518,001 Up	1931	Willard	WS-1-13	Pos.	Clum	9150	20	*	1110	*	63	63-1158	1158
1706	DODGE	DG	4,508,001 Up	1931	Willard	WS-1-15	Pos.	Clum	9150	20	*	1110	*	63	63-1158	1158
1708	DUESENBERG	J		1931	Exide	3-XCRV-21-2G	Neg.	Delco-Remy	486-D	*	DR.5759	1110	*	63	63	1129
1710	DU PONT	G		1930-31	Exide	3-XC-15-1	Pos.	Sor.Man.		15	*	1110	81	63	63	1129
1712	DURANT	4-07		1930	U.S.L.	3-CVX-6X-6A	Neg.	Clum	5192	20	*	1110	63	*	63-1158	1158
1712	DURANT	6-10		1931	U.S.L.	3-CVX-6X-6A	Neg.	Clum	5192	20	*	1110	63	*	63-1158	1158
1714	DURANT	6-12		1931	U.S.L.	3-CVX-6X-6A	Neg.	Clum	5192	20	*	1110	63	*	63-1158	1158
1714	DURANT	6-14		1931	U.S.L.	3-CVX-6X-6A	Neg.	Clum	5192	20	*	1110	63	*	63-1158	1158
*1566	ELCAR	6-95A		1931	U.S.L.	XY-13X-6	Neg.	Finger Tip Control		*	*	1110	*	63	63	87
*1568	ELCAR	8-96		1931	U.S.L.	3-HVX-6X-6A	Neg.	Delco-Remy	1303	*	*	1110	*	63	63	87
*1570	ELCAR	130		1931	U.S.L.	3-HVX-6X-6A	Neg.	Finger Tip Control		*	*	1110	*	63	63	87
*1570	ELCAR	140		1931	U.S.L.	3-HVX-6X-6A	Neg.	Finger Tip Control		*	*	1110	*	63	63	87
1716	ESSEX	Super 6		1931	Exide	3-XI-13-1G	Neg.	Sor.Man.		20	*	1110	*	63	63	87
1718	FORD	A		1931	Ford		Pos.	Ford	A-11654-B	*	*	1110	63	63	63	1129
1720	FRANKLIN	Series 15		1931	National	619-SM	Pos.	Hersey		20	*	1110	63	63	63	87-1129
1722	GARDNER	136		1931	P-O-L	615-JFK	Pos.	Delco-Remy	420-Q	10	*	1110	63	63	63	87
1724	GARDNER	148		1931	P-O-L	615-JFK	Pos.	Delco-Remy	420-Q	10	*	1110	63	63	63	87
1726	GARDNER	158		1931	P-O-L	617-RHK	Pos.	Delco-Remy	420-Q	10	*	1110	63	63	63	87
1728	GRAHAM	53		1931	Willard	WS-2-15	Pos.	B. & S.	50239	20	*	1110	63	*	63	87
1728	GRAHAM	54		1931	Willard	WS-2-15	Pos.	B. & S.	50239	20	*	1110	63	*	63	87
1730	GRAHAM	49		1931	Willard	WS-2-15	Pos.	B. & S.	50239	20	*	1110	63	*	63	87
1732	GRAHAM	Custom 8		1931	Willard	WS-2-15	Pos.	B. & S.	50239	20	*	1110	63	*	63	87
1734	HUDSON	Greater 8		1931	Exide	3-XI-13-1G	Neg.	Sor.Man.		20	*	1110	*	63	63	87
1736	HUPMOBILE	Century 6		1930-31	Willard	WSB-13	Pos.	Sor.Man.		20	*	1110	63	*	63	87
1738	HUPMOBILE	Century 8		1930-31	Willard	WJ-2-13	Pos.	Sor.Man.		20	*	1110	63	*	63	87
1740	HUPMOBILE	C		1931	Willard	SJRR-4	Pos.	Sor.Man.		15	*	1110	63	*	63	87
1742	HUPMOBILE	H, U		1931	Willard	SJRR-5	Pos.	Sor.Man.		15	*	1110	63	*	63	87
*1602	JORDAN	80		1931	Willard	WSB-15	Neg.	Sor.Man.		*	Kellogg	1110	63	*	63-1158	1158
* 852	JORDAN	90		1931	Willard	WSB-15	Neg.	Sor.Man.		*	Kellogg	1110	*	63	63	87

Page numbers indicated by (*) refer to the Twenty-third Supplement.

1931 CAR MODELS—EQUIPMENT USED

Make	IGNITION		Switch	STARTER		GENERATOR		Relay	Year	Model	CAR	Page	
	Coil Model	Dist. Model		Make	Model	Make	Model						
Delco-Remy	528-C	660-Z	Electrolock	9-A	Delco-Remy	722-F	Delco-Remy	955-H	265-B	1931	8-98	AUBURN	1670
Auto-Lite	IG-4065	IGB-4034-A	B. & S.		Auto-Lite	MAK-4001	Auto-Lite	GAS-4101	CB-4008	1931	Bantam	AUSTIN	1672
Delco-Remy	528-H	660-L	Oakes	Hershey	Delco-Remy	725-N	Delco-Remy	940-T-3	265-B	1931	8-50	BUICK	1674
Delco-Remy	528-H	660-E	Oakes	Hershey	Delco-Remy	725-L	Delco-Remy	940-T-2	265-B	1931	8-60	BUICK	1676
Delco-Remy	528-H	660-E	Oakes	Hershey	Delco-Remy	725-L	Delco-Remy	940-T-2	265-B	1931	8-80, 8-90	BUICK	1676
Delco-Remy	530-B	4055	Delco-Remy	426-P	Delco-Remy	728-D	Delco-Remy	927-D	266-N	1931	355	CADILLAC	1678
Delco-Remy	530-G	4069	Delco-Remy		Delco-Remy	457	Delco-Remy	927-D	266-N	1931	370	CADILLAC	1680
Delco-Remy	530-H	4057	Delco-Remy	426-M	Delco-Remy	457	Delco-Remy	927-K	266-E	1931	452	CADILLAC	1682
Delco-Remy	528-B	633-G	Delco-Remy	427-H	Delco-Remy	714-L	Delco-Remy	943-J	265-H	1931	AE	CHEVROLET	1684
Delco-Remy	526-T	632-K	Coil Lock Switch		Delco-Remy	725-Q	Delco-Remy	943-R	265-G	1931	CM	CHRYSLER	1686
Delco-Remy	526-T	660-G	Coil Lock Switch		Delco-Remy	728-K	Delco-Remy	943-R	265-G	1931	CD, CDX	CHRYSLER	1688
Delco-Remy	526-T	660-F	Coil Lock Switch		Delco-Remy	728-N	Delco-Remy	957-U	265-B	1931	CG	CHRYSLER	1690
Delco-Remy	526-V	658-W	Coil Lock Switch		Delco-Remy	728-N	Delco-Remy	957-J	265-J	1931	L-29	CORD	1692
North East	5023660	10874	Coil Lock Switch		Delco-Remy	350	Delco-Remy	285	265-B	1930-31	V-9	CUNNINGHAM	1694
Delco-Remy	526-K	632-D	Coil Lock Switch		Delco-Remy	714-Q	Delco-Remy	943-R	265-G	1930-31	CK	DE SOTO	1696
Delco-Remy	526-T	632-L	Coil Lock Switch		Delco-Remy	725-Q	Delco-Remy	943-R	265-G	1931	SA	DE SOTO	1698
Delco-Remy	526-N	660-D	Coil Lock Switch		Delco-Remy	714-Q	Delco-Remy	943-L	265-G	1931	CF	DE SOTO	1700
Auto-Lite	IG-4082	IGB-4031	Coil Lock Switch		Auto-Lite	MAJ-4001	Auto-Lite	GAL-4330	CB-4014	1931	6-75	DE VAUX	1702
Delco-Remy	533-V	632-K	Coil Lock Switch		Delco-Remy	725-Q	Delco-Remy	943-R	265-G	1931	DH	DODGE	1704
Delco-Remy	533-V	660-G	Coil Lock Switch		Delco-Remy	725-Q	Delco-Remy	943-R	265-G	1931	DG	DODGE	1706
Delco-Remy	553-A,B	4044	Coil Lock Switch		Delco-Remy	429	Delco-Remy	428	265-B	1931	J	DUESENBERG	1708
Delco-Remy	528-C	668-B			Delco-Remy	720-Q	Delco-Remy	945-U	265-B	1930-31	G	DU PONT	1710
Auto-Lite	IG-4082	IGB-4043	Coil Lock Switch		Auto-Lite	MAJ-4007	Auto-Lite	GAL-4330	CB-4014	1930	4-07	DURANT	1712
Auto-Lite	IG-4082	IGB-4043	Coil Lock Switch		Auto-Lite	MAJ-4007	Auto-Lite	GAL-4330	CB-4014	1931	6-10	DURANT	1712
Auto-Lite	IG-4082	IGB-4031	Coil Lock Switch		Auto-Lite	MAJ-4001	Auto-Lite	GAL-4130	CB-4014	1931	6-12	DURANT	1714
Auto-Lite	IG-4082	IGB-4031	Coil Lock Switch		Auto-Lite	MAJ-4001	Auto-Lite	GAL-4130	CB-4014	1931	6-14	DURANT	1714
Delco-Remy	528-C	631-F	Shaler Lock		Delco-Remy	716-A	Delco-Remy	955-H	265-B	1931	6-75A	ELCAR	*1566
Delco-Remy	528-C	651-C	Shaler Lock		Delco-Remy	716-A	Delco-Remy	955-H	265-B	1931	8-96	ELCAR	*1568
Delco-Remy	553-H	668-H	Coil Lock Switch		Delco-Remy	725-G	Delco-Remy	945-U	265-B	1931	130	ELCAR	*1570
Delco-Remy	553-H	668-H	Coil Lock Switch		Delco-Remy	725-G	Delco-Remy	945-U	265-B	1931	140	ELCAR	*1570
Auto-Lite	CE-4015	IGB-4033	Electrolock	9-B	Auto-Lite	MAJ-4009	Auto-Lite	GAM-4102	CB-4016	1931	SS	ESSEX	1716
Ford			Electrolock	6-A	Ford		Ford			1931	A	FORD	1718
Delco-Remy	532-C	642-P	Coil Lock Switch		Delco-Remy	723-C	Delco-Remy	957-E	265-B	1931	15	FRANKLIN	1720
Delco-Remy	526-W	640-L	Coil Lock Switch		Delco-Remy	716-A	Delco-Remy	955-H	265-B	1931	136	GARDNER	1722
Delco-Remy	526-W	658-B	Coil Lock Switch		Delco-Remy	716-A	Delco-Remy	955-H	265-B	1931	148	GARDNER	1724
Delco-Remy	526-W	658-R	Coil Lock Switch		Delco-Remy	720-Y	Delco-Remy	955-K	265-B	1931	158	GARDNER	1726
Delco-Remy	528-C	632-F	Oakes	Hershey	Delco-Remy	714-V	Delco-Remy	957-B	265-B	1931	53	GRAHAM	1728
Delco-Remy	528-C	632-F	Oakes	Hershey	Delco-Remy	714-V	Delco-Remy	957-B	265-B	1931	54	GRAHAM	1728
Delco-Remy	528-C	660-C	Oakes	Hershey	Delco-Remy	725-M	Delco-Remy	957-B	265-B	1931	49	GRAHAM	1730
Delco-Remy	528-C	668-J	Oakes	Hershey	Delco-Remy	725-G	Delco-Remy	957-C	265-B	1931	Cust. 8	GRAHAM	1732
Auto-Lite	CE-4015	IGH-4009-A	Electrolock	9-B	Auto-Lite	MAB-4034	Auto-Lite	GAM-4102	CB-4016	1931	Grt. 8	HUDSON	1734
Auto-Lite	IG-4080	IGC-4046	Electrolock	9-B	Auto-Lite	MAJ-4003	Auto-Lite	GAL-4124	CB-4014	1930-31	Cent. 6	HUPMOBILE	1736
Auto-Lite	CE-4014	IGH-4008-C	Electrolock	9-B	Auto-Lite	MAD-4113	Auto-Lite	GAL-4138	CB-4012	1930-31	Cent. 8	HUPMOBILE	1738
Auto-Lite	CE-4001	IGH-4008	Electrolock	5-B	Auto-Lite	MAB-4021	Auto-Lite	GAG-4118	CB-4012	1931	C	HUPMOBILE	1740
Auto-Lite	CE-4001	IGH-4008	Electrolock	9-B	Auto-Lite	MR-4102	Auto-Lite	GAG-4118	CB-4012	1931	H & U	HUPMOBILE	1742
Auto-Lite	CE-4009	IGH-4005-A	Oakes	Hershey	Auto-Lite	MUA-4007	Auto-Lite	GAL-4326	CB-4014	1931	80	JORDAN	*1602
Auto-Lite	CE-4009	IGJ-4001-A	Oakes	Hershey	Auto-Lite	MUA-4007	Auto-Lite	GAG-4109	CB-4012	1931	90	JORDAN	*852

1931 CAR MODELS—EQUIPMENT USED

Page	CAR	Model	Serial No.	Year	BATTERY			Gr. Ter.	Switch Make	LIGHTING							
					Make	Type	Make			Circuit	Edison	Mazda	Lamp Numbers	Head	Aux.	Side	Dsh.-tail	Stop Dome
*1604	JORDAN	Speedway Z.		1931	Willard	RJ-15	Neg.	Sor.Man.		*	Kellogg	1110	63	*	63	87	*
*1606	KISSEL	6-73		1931	Willard	CWR-13	Pos.	Clum	10677	10	*	1133	*	63	64-63	63	64
*1608	KISSEL	8-95		1931	Willard	SJWR-4	Pos.	Clum	10677	10	*	1133	*	63	64-63	63	64
*1610	KISSEL	8-126		1931	Willard	SJWR-4	Pos.	Clum	10677	10	*	1133	*	81	82-81	81	64
1744	LA SALLE	345	900,001 Up	1931	Delco-Remy	15-CW	Pos.	Delco-Remy	486-D	*	DR-5759	1110	63	*	63	87	63
1746	LINCOLN		66,001 Up	1931	Exide	3-LXC-15-1RD	Neg.	Lincoln		*	DR.5778	1110	*	63	63	1129	81
1748	MARMON	70		1931	National	H3-15X	Pos.	Pines	A-312	*	DR.410-C	1110	63	*	63	87	64
1750	MARMON	88		1931	Exide	3-MXC-19-1	Pos.	Pines	A-312	*	DR.410-C	1110	63	*	63	87	64
1752	NASH	6-60	R-249,708 Up	1931	U.S.L.	3-HVX-5X-6	Neg.	Sor.Man.	4210-A	20	*	1110	*	63	63	87	*
1754	NASH	8-70	X-1001 Up	1931	U.S.L.	3-HVX-6X-6	Neg.	Sor.Man.	4210-A	20	*	1110	*	63	63	87	*
1756	NASH	8-80	B-54928 Up	1931	U.S.L.	3-HVX-6X-6A	Pos.	Delco-Remy	486-C	20	*	1110	63	*	63	87	*
1758	NASH	8-90	509,201 Up	1931	Exide	3-LXC-17-1	Pos.	Delco-Remy	486-K	20	*	1110	63	*	63	87	*
1760	OAKLAND	301	296,001 Up	1931	Various		Neg.	Clum	9191	20	*	1110	63	*	63	87	63
1762	OLDSMOBILE	F-31		1931	Willard	WS-1-13	Neg.	Delco-Remy	478-F	*	DR.410-C	1110	63	*	63	87	63
1764	PACKARD	726, 733		1930	P-O-L	A-615-SF	Pos.	Packard		20	*	1110	63	*	63	1129	*
1764	PACKARD	740, 745		1930	P-O-L	A-617-SF	Pos.	Packard		20	*	1110	63	*	63	1129	*
1766	PACKARD	826, 833		1931	P-O-L	A-617-S	Pos.	Packard		20	*	1110	63	*	63	1129	*
1766	PACKARD	8-40, 8-45		1931	P-O-L	A-617-S	Pos.	Packard		20	*	1110	63	*	63	1129	*
1768	PEERLESS	6-61A		1930	U.S.L.	3-HVX-5X-6A	Pos.	Sor.Man.		20	*	1110	*	63	63	87	63
1770	PEERLESS	A		1931	Willard	WSB-15	Pos.	Pines	A-808	*	*	1110	63	*	63	87	63
1772	PEERLESS	B, C		1931	Willard	WSB-19	Pos.	Pines	A-808	*	*	1110	63	*	63	87	63
1774	PIERCE ARROW	41, 42	See Page	1931	Willard	WJ-4-15	Pos.	Delco-Remy	486-D	*	DR.410-E.1000	81	*	63-81	1129	87	
1776	PIERCE ARROW	43	1,500,001 Up	1931	Willard	WJ-4-15	Pos.	Delco-Remy	486-D	*	DR.410-E.1000	81	*	63-81	1129	87	
1778	PLYMOUTH	30-U		1930-31	Willard	WS-1-13	Pos.	Clum	9150	20	*	1110	63	*	63-1158	1158	87
1780	PONTIAC	401	649,001 Up	1931	Various		Neg.	Clum	9191	20	*	1110	63	*	63	87	63
1782	REO	25	25N-1 Up	1931	Willard	SJRR-4	Neg.	Delco-Remy	482-F	20	*	1110	63	*	63	87	64
1784	REO	N-30	30N-1 Up	1931	Willard	RJ-4-15	Neg.	Delco-Remy	482-F	20	*	1110	63	*	63	87	64
1784	REO	N-35	35N-1 Up	1931	Willard	RJ-4-15	Neg.	Delco-Remy	482-F	20	*	1110	63	*	63	87	64
1786	ROLLS ROYCE	Phantom		1930-31	Exide	3-XC-21-1	Pos.	Rolls Royce	A-14527	10	*	1110	*	63	64-63	1129	*
1788	RUXTON	C	1001 Up	1930	Willard	GRR-5C-BD	Pos.	Sor.Man.	2560-A	15	*	1110	63	*	63	1129	63
1790	STUDEBAKER	53		1930	Willard	WJ-1-11	Pos.	Delco-Remy	486-E	*	DR.410-F.1110	63	*	63	87	81	
1790	STUDEBAKER	54		1931	Willard	WJ-1-11	Pos.	Clum	9115	*	DR.410-F.1110	63	*	63	87	81	
1792	STUDEBAKER	61		1931	Willard	WJ-4-15	Pos.	Clum	9115	*	DR.410-F.1110	63	*	63	87	81	
1794	STUDEBAKER	70		1931	Willard	WJ-4-15	Pos.	Clum	9115	*	DR.410-F.1110	63	*	63	87	81	
1796	STUDEBAKER	80, 90		1931	Willard	WJ-4-15	Pos.	Clum	9115	*	DR.410-F.1110	63	*	63	87	81	
1798	STUTZ	LA		1931	P-O-L	A-617-SH	Neg.	Delco-Remy	486-G	*	DR.410-C.1133	*	63	63	87	63	
*1436	STUTZ	MA, MB		1931	P-O-L	A-617-SH	Neg.	Delco-Remy	486-G	*	DR.410-C.1133	*	63	63	87	63	
*1658	VIKING	V-30		1931	Willard	WSB-15	Neg.	Delco-Remy	486-B	*	DR.410-C.1110	63	*	63	87	63	
1800	WHIPPET	96-A		1931	U.S.L.	3-CVX-5X-6A	Neg.	Pines	A-805	20	*	1110	*	63-1158	1158	63	
1802	WILLYS SIX	97, 98-D	1001 Up	1931	U.S.L.	XY-13X-7A	Neg.	Pines	A-805	20	*	1110	63	63	63-1158	1158	63
1804	WILLYS EIGHT	8-80	1001 Up	1930	U.S.L.	3-HVX-7X-6A	Neg.	Pines	A-805	20	*	1110	*	63	63-1158	1158	63
1804	WILLYS EIGHT	8-80D	1001 Up	1931	U.S.L.	3-HVX-7X-6A	Neg.	Pines	A-805	20	*	1110	*	63	63-1158	1158	63
1806	WILLYS KNIGHT	87	1001 Up	1931	U.S.L.	3-HVX-6X-6A	Neg.	Pines	A-805	20	*	1110	63	*	63-1158	1158	63
1808	WILLYS KNIGHT	66-D	1001 Up	1931	U.S.L.	3-HVX-8X-6A	Neg.	Pines	A-805	20	*	1110	63	63	63-1158	1158	63
*1518	WINDSOR	6-69		1931	U.S.L.	XY-13X	Neg.	Delco-Remy	1303	*	DR	1110	*	63	63	*	63
*1520	WINDSOR	6-75, 77		1931	U.S.L.	XY-15X-6	Neg.	Delco-Remy	1309	*	*	1110	*	81	63	87	81
*1522	WINDSOR	8-82, 92		1931	U.S.L.	3-HVX-7X	Neg.	Delco-Remy	1309	*	*	1110	*	81	63	87	81

Page numbers indicated by (*) refer to the Twenty-third Supplement.

1931 CAR MODELS—EQUIPMENT USED

Make	IGNITION		Switch	STARTER		GENERATOR		Relay		Year	Model	CAR	Page	
	Coil Model	Dist. Model		Make	Model	Make	Model	Regulator						
Auto-Lite	CE-4009	IGJ-4001-A	Oakes	Hershey	Auto-Lite	ML-4146	Auto-Lite	GAG-4108	CB-4012	1931	Z	JORDAN	*1604	
Delco-Remy	528-C	640-L	Clum		4790	Delco-Remy	716-A	Delco-Remy	955-H	265-B	1931	6-73	KISSEL	*1606
Delco-Remy	528-C	658-L	Clum		4790	Delco-Remy	716-A	Delco-Remy	955-H	265-B	1931	8-95	KISSEL	*1608
Delco-Remy	528-C	668-B	Clum		4790	Delco-Remy	720-Q	Delco-Remy	941-W	265-B	1931	8-126	KISSEL	*1610
Delco-Remy	530-B	4055	Delco-Remy	426-P	Delco-Remy	728-D	Delco-Remy	927-D	266-N	1931	345	LA SALLE	1744	
Auto-Lite	CE-4001-L	IGL-4001	Co-incidental		Auto-Lite	MAL-4001	Auto-Lite	GAU-4001	CB-4014	1931		LINCOLN	1746	
Delco-Remy	528-K	652-D	Coil Lock Switch		Delco-Remy	714-C	Delco-Remy	949-X	265-B	1931	70	MARMON	1748	
Delco-Remy	528-K	652-D	Coil Lock Switch		Delco-Remy	718-M	Delco-Remy	949-F	265-B	1931	88	MARMON	1750	
Auto-Lite	IG-4065	IGB-4015	Oakes	Hershey	Auto-Lite	MAB-4026	Auto-Lite	GAL-4239	CB-4014	1931	6-60	NASH	1752	
Auto-Lite	IG-4065	IGH-4017	Oakes	Hershey	Auto-Lite	MAB-4026	Auto-Lite	GAL-4239	CB-4014	1931	8-70	NASH	1754	
Auto-Lite	CE-4001	IGK-4003	Delco-Remy	425-P	Auto-Lite	MAB-4033	Auto-Lite	GAR-4204	CB-4014	1931	8-80	NASH	1756	
Auto-Lite	CE-4001	IGK-4001	Delco-Remy		Auto-Lite	MAB-4024	Auto-Lite	GAR-4204	CB-4014	1931	8-90	NASH	1758	
Delco-Remy	526-R	661-B	Coil Lock Switch		Delco-Remy	726-H	Delco-Remy	959-J	265-G	1931	301	OAKLAND	1760	
Delco-Remy	533-U	639-G	Coil Lock Switch		Delco-Remy	714-H	Delco-Remy	955-R	265-G	1931	F-31	OLDSMOBILE	1762	
North East	5022293	5010896	Coil Lock Switch		Owen-Dyneto	DI-850	Owen-Dyneto	CD-865	20220	1930	7-26, 33	PACKARD	1764	
North East	5022293	5010896	Coil Lock Switch		Owen-Dyneto	DN-860	Owen-Dyneto	CD-865	20220	1930	7-40, 45	PACKARD	1764	
North East	5025430	5010896	Coil Lock Switch		Owen-Dyneto	DI-850	Owen-Dyneto	CL-896	20530	1931	8-26, 33	PACKARD	1766	
North East	5025430	5010896	Coil Lock Switch		Owen-Dyneto	DM-693	Owen-Dyneto	CL-896	20530	1931	8-40, 45	PACKARD	1766	
Delco-Remy	528-C	631-F	Electrolock	5-B	Delco-Remy	718-H	Delco-Remy	949-V	265-G	1930	6-61A	PEERLESS	1768	
Auto-Lite	CE-4302	IGH-4011-A	Coil Lock Switch		Auto-Lite	MAB-4029	Auto-Lite	GAL-4134	CB-4014	1931	A	PEERLESS	1770	
Auto-Lite	CE-4013	IGH-4010	Coil Lock Switch		Auto-Lite	ML-4146	Auto-Lite	GAR-4111	CB-4014	1931	B & C	PEERLESS	1772	
Delco-Remy	528-E	668-E	Oakes	Hershey	Delco-Remy	728-C	Delco-Remy	927-F	265-B	1931	41, 42	PIERCE ARROW	1774	
Delco-Remy	528-E	660-P	Oakes	Hershey	Delco-Remy	728-C	Delco-Remy	927-L	265-B	1931	43	PIERCE ARROW	1776	
Delco-Remy	526-M	629-A	Coil Lock Switch		Delco-Remy	714-Q	Delco-Remy	943-R	265-G	1930-31	30-U	PLYMOUTH	1778	
Delco-Remy	526-R	639-U	Coil Lock Switch		Delco-Remy	714-R	Delco-Remy	943-J	265-H	1931	401	PONTIAC	1780	
Delco-Remy	528-E	640-S	Delco-Remy	425-R	Delco-Remy	728-M	Delco-Remy	955-G	265-B	1931	25	REO	1782	
Delco-Remy	528-E	660-K	Delco-Remy	425-R,T	Delco-Remy	728-M	Delco-Remy	955-G	265-B	1931	30	REO	1784	
Delco-Remy	528-E	660-K	Delco-Remy	425-R,T	Delco-Remy	728-M	Delco-Remy	955-G	265-B	1931	35	REO	1784	
De Jon	CAA-4002	IAA-4004	Rolls Royce	A-14527	Rolls Royce	A-9860	Rolls Royce	A-9547	A-10194	1930-31	Phantom	ROLLS ROYCE	1786	
Auto-Lite	CE-4001	IGH-4005-A	Oakes	Hershey	Auto-Lite	MUA-4007	Auto-Lite	GAG-4121	CB-4012	1930-31	C	RUXTON	1788	
Delco-Remy	533-Y	639-J	Coil Lock Switch		Delco-Remy	718-L	Delco-Remy	955-U	265-B	1931	53	STUDEBAKER	1790	
Delco-Remy	533-Y	639-J	Coil Lock Switch		Delco-Remy	718-L	Delco-Remy	943-J	265-B	1931	54	STUDEBAKER	1790	
Delco-Remy	533-Y	658-Z	Coil Lock Switch		Delco-Remy	718-Q	Delco-Remy	955-C	265-B	1931	61	STUDEBAKER	1792	
Delco-Remy	528-E	658-Z	Oakes	Hershey	Delco-Remy	718-Q	Delco-Remy	955-C	265-B	1931	70	STUDEBAKER	1794	
Delco-Remy	528-E	668-C	Oakes	Hershey	Delco-Remy	728-C	Delco-Remy	927-J	265-B	1931	80, 90	STUDEBAKER	1796	
Delco-Remy	528-C	4033	Delco-Remy	426-K	Delco-Remy	726-C	Delco-Remy	391	265-B	1931	LA	STUTZ	1798	
Delco-Remy	531-C	4028	Delco-Remy	426-K	Delco-Remy	726-C	Delco-Remy	391	266-N	1931	MA, MB	STUTZ	*1436	
Delco-Remy	528-P	658-T	Coil Lock Switch		Delco-Remy	725-H	Delco-Remy	955-R	265-G	1931	V-30	VIKING	*1658	
Auto-Lite	IG-4083	IGB-4042-A	Coil Lock Switch		Auto-Lite	MZ-4018	Auto-Lite	GAL-4116	CB-4014	1930-31	96-A	WHIPPET	1800	
Auto-Lite	IG-4303	IGB-4032	Coil Lock Switch		Auto-Lite	MZ-4024	Auto-Lite	GAL-4131	CB-4014	1931	97, 98-D	WILLYS SIX	1802	
Auto-Lite	IG-4083	IGH-4013	Coil Lock Switch		Auto-Lite	MAB-4031	Auto-Lite	GAL-4131	CB-4014	1930	8-80	WILLYS EIGHT	1804	
Auto-Lite	IG-4303	IGH-4013	Coil Lock Switch		Auto-Lite	MAB-4035	Auto-Lite	GAL-4131	CB-4014	1931	8-80D	WILLYS EIGHT	1804	
Auto-Lite	IG-4083	IGC-4045	Coil Lock Switch		Auto-Lite	MAB-4014	Auto-Lite	GAL-4103	CB-4014	1931	87	WILLYS KNIGHT	1806	
Auto-Lite	IG-4303	IGC-4052	Coil Lock Switch		Auto-Lite	MAB-4018	Auto-Lite	GAG-4130	CB-4014	1931	66-D	WILLYS KNIGHT	1808	
Auto-Lite	IG-4066	IGB-4029-A	Delco-Remy	1302	Auto-Lite	MAD-4105	Auto-Lite	GAL-4123	CB-4012	1931	6-69	WINDSOR	*1518	
Delco-Remy	526-W	640-F	Coil Lock Switch		Delco-Remy	714-G	Delco-Remy	949-V	265-B	1931	6-75, 77	WINDSOR	*1520	
Delco-Remy	526-W	658-H	Coil Lock Switch		Delco-Remy	724-J	Delco-Remy	940-N	265-B	1931	8-82, 92	WINDSOR	*1522	

AUBURN

MODEL 8-98 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—U.S.L. Type XY-15X-6A, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 119 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 21 hours. Battery is mounted under the right front seat.

IGNITION:—Coil Model 528-C. Coil is mounted under the cowl. Ignition current is .6-3 amperes with engine idling and 4.6 amperes at 6 volts with engine stopped. The ignition switch is a Type 9-A Electrolock.

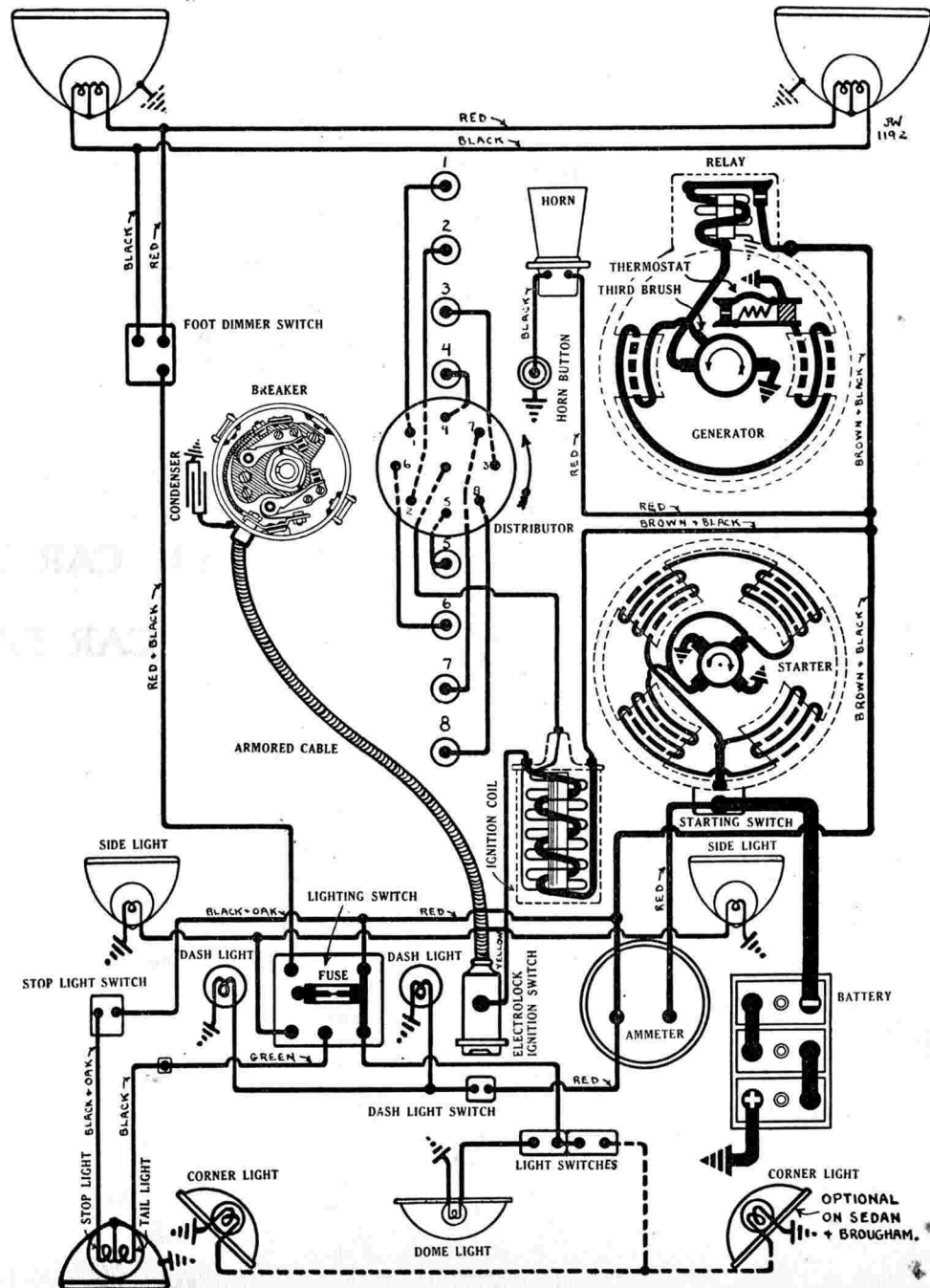
Distributor Model 660-Z. Breaker contacts separate .018-.025 inch. Set contact gap by loosening lock screw on stationary contact mounting plate (directly behind breaker arm) and turning eccentric adjusting screw until breaker gap is .022 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oil-stone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 15 degrees. Automatic advance begins at 400 R.P.M. of the engine. Maximum automatic advance is 25 degrees reached at 3200 R.P.M. of the engine. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized to secure this firing interval for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head. The Electrolock must be removed as a unit with the distributor whenever the distributor is taken off the car. A complete description of the Electrolock and full directions on removing the Electrolock from the distributor will be found in the Equipment Section. To remove distributor, free Electrolock at dash, disconnect manual spark control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft housing with medium cup grease and turn down one turn each month or every 1000 miles of operation. At the same time remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil and put one drop of oil on the breaker arm pivot pins. Coat the breaker arm cam with a light film of vaseline.

Timing:—**Synchronization of Contacts.** Use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section to synchronize contacts. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over 90 degrees when piston No. 6 will reach firing position ($3\frac{1}{2}$ teeth on the flywheel before top dead center with manual spark control full advanced). Then loosen the lock screws on the movable sub-plate (on which the second set of contacts are mounted) and turn the eccentric adjusting screw until the contacts begin to open. Tighten the lock screws and check the contact gap with the breaker arm on the lobe of the cam. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization. The first method of synchronization using special Delco-Remy tool is recommended.

Timing of Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position 13 degrees or $3\frac{1}{2}$ teeth on the flywheel before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully



AUBURN

MODEL 8-98 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

advance the manual spark control and see that the distributor is rotated counter-clockwise as far as possible. Then turn engine over until piston reaches a position 13 degrees or $3\frac{1}{2}$ teeth (measured on the flywheel) before top dead center. Loosen the advance arm clamp screw and rotate the distributor slightly until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the the clamp screw and connect the spark plugs as shown on the diagram. The second set of contacts (mounted on the movable sub-plate) open 45 degrees after this point when piston No. 6 reaches firing position.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Champion Type C-4. Gaps are .020-.025 inch.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1 $\frac{7}{16}$ inches. Stem diameter, .3410-.3425 inch. Stem length, $5\frac{1}{4}$ inches. Valve lift, $\frac{11}{32}$ inch. Spring pressure, 46-51 pounds (valve closed—spring length, 2 $\frac{3}{16}$ inches) and 87-82 pounds (valve open—spring length, 1 $\frac{27}{32}$ inches). Tappet clearance, .006-.008 inch hot (operating) and .010 inch (for timing). Inlet valves open 5 degrees before top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, 1 $\frac{13}{32}$ inches. Stem diameter, .3410-.3425 inch. Stem length, $5\frac{1}{4}$ inches. Valve lift, $\frac{11}{32}$ inch. Spring pressure, 46-51 pounds (valve closed—spring length, 2 $\frac{3}{16}$ inches) and 87-92 pounds (valve open—spring length, 1 $\frac{27}{32}$ inches). Tappet clearance, .006-.008 inch hot (operating) and .010 inch (for timing). Exhaust valves open 50 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are made for replacement.

STARTER:—Model 722-F. Starter is connected to the engine through a set of reduction gears and an Outboard Bendix drive. The direction of rotation (armature shaft) is clockwise, viewed from the commutator end. Starter cranks the engine at 134 R.P.M. (normal speed) drawing 175 amperes. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
11 "	1200	5	175
22 "	Lock	3	600

Mounting:—Starter is flange mounted at the right of the engine on the forward face of the flywheel housing. To remove starter, disconnect cable and starting switch control and take out three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles. The drive end bearings are fitted with oilless bushings. Every six months repack the reduction gears with graphite grease.

GENERATOR:—Model 955-H. The direction of rotation is counter-clockwise,

viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance which is connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round headed lock screw on the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting, the maximum charging rate is 21 amperes (cold) at 8.5 volts reached at 1450 R.P.M. of the generator armature or 20 M.P.H.

Generator Data					
Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
21	8.5	1450	12	7.5	2000

Motoring, generator draws 5.5 amperes at 6 volts. Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted on special swinging bracket at right of the engine and is belt driven from the crankshaft. The water pump is mounted directly on the commutator end of the generator and is driven by an extension of the armature shaft. To remove generator first drain radiator and remove water pump hose connections. Then loosen adjustment clamp bolt and swing generator toward engine. Slip off drive belt. Then remove two bolts forming generator bracket hinge and lift generator from place. The water pump can then be removed by taking out the capscrews which mount the pump on the generator end plate bosses.

Belt Adjustment. To adjust drive belt, loosen bracket bolts and adjustment clamp bolt and swing generator away from engine until proper belt tension is secured. The belt tension should be just sufficient to drive the generator and water pump without slipping.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator field frame. Relay contacts close at 600 R.P.M. (generator armature) or 8.3 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 1-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Soreng-Manegold Lighting Switch.** Delco-Remy Dimmer Switch. Lighting switch is mounted on the instrument panel. Dimmer switch is mounted on the toeboard. Headlights are equipped with double filament bulbs. Head lights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Cowl lights instrument light are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome light and side lights (optional on Sedan and Brougham) are each 6-8 volt, 6 cp. S.C. Mazda 81. Stop light and tail light are 6-8 volt, 21-2 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead (black) must be connected to the 2 cp. filament.

FUSES:—Lighting fuse mounted on back of lighting switch is 20 ampere capacity.

AMERICAN AUSTIN

BANTAM MODEL—PRODUCTION STARTED MAY 1, 1930

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—U.S.L., Type 3-CYX-4X-7A, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 60 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 12 hours. Battery is mounted in a recess in the cowl under the engine hood on the right side of the car.

IGNITION:—Coil Model IG-4065. Coil is mounted on the engine side of the dash. Ignition current is 3 amperes at 6.5 volts with engine running and 4 amperes at 6.4 volts with engine stopped. Ignition is controlled by the key in the combination switch on the instrument panel.

Distributor Model IGB-4034-A. Breaker contacts separate .018-.020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until gap is .022 inch ((new) or .020 inch (after 1000 miles) with the breaker arm on the lobe of the cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is full automatic. Automatic advance begins at 600 R.P.M. of the engine. Maximum automatic advance is 22 degrees (flywheel) reached at 2800 R.P.M. of the engine.

Mounting:—Distributor is mounted on the commutator end of the generator at the front of the engine. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the side of the distributor every 500 miles of operation. Every 1000 miles remove the distributor head and rotor and put one drop of oil on the breaker arm pivot pin and put a small bit of vaseline on the face of the breaker cam.

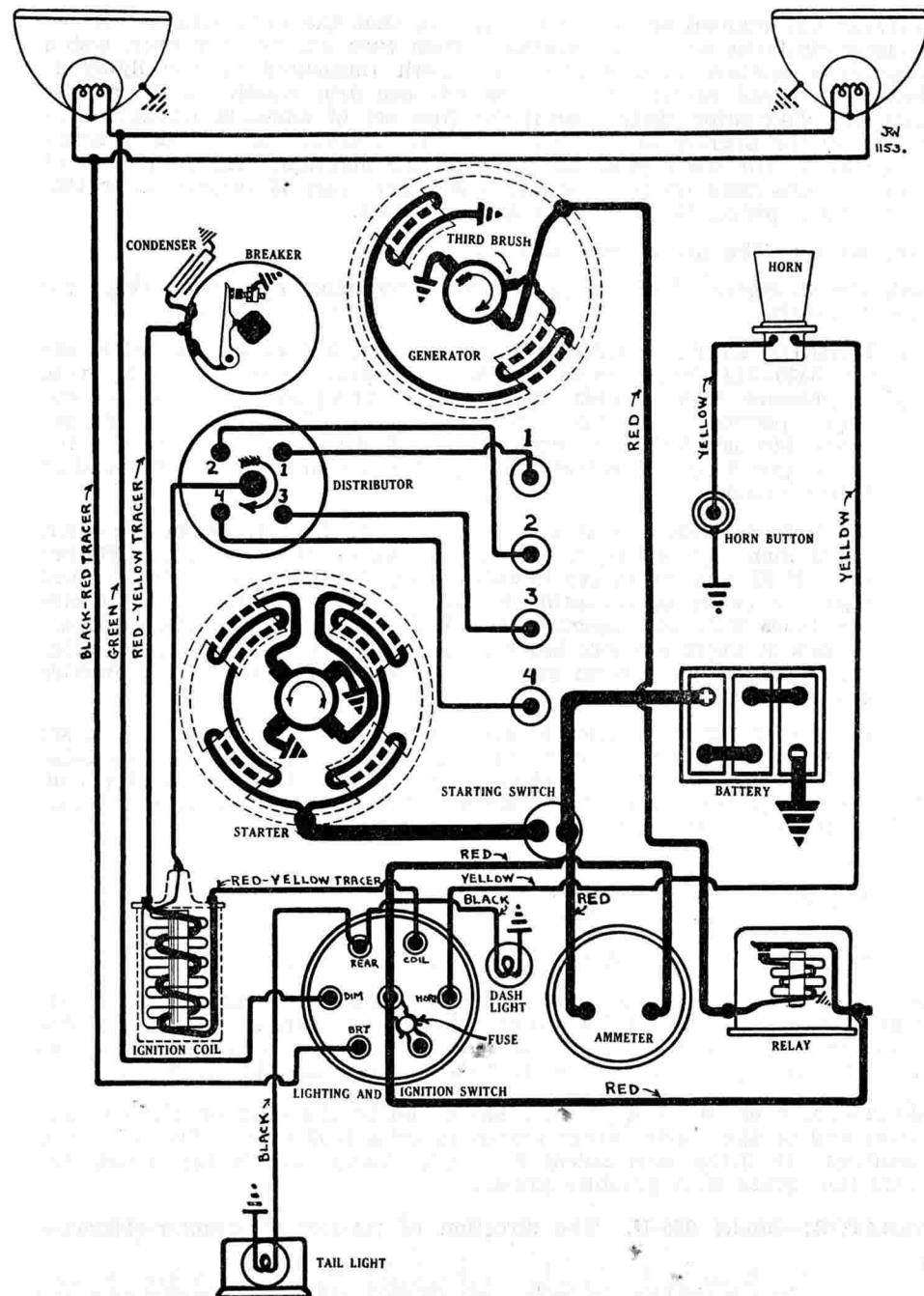
Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position .020 inch (actual piston travel) before top dead center. To set ignition, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Take out the spark plug in cylinder No. 1 and screw the special timing gauge in place in the spark plug port (see Equipment Section for full details of this gauge). Turn the engine over to top dead center and set gauge at zero. Then turn engine over until piston No. 1 is again coming up on compression and stop when gauge indicates piston is .020 inch before top dead center. Loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and connect the spark plugs as shown on the diagram. The firing position (.020 inch before top dead center) is approximately $\frac{3}{4}$ inch on the flywheel before the top dead center mark for cylinder No. 1.

Firing Order:—The firing order is 1-3-4-2.

Spark Plugs:—Spark plugs are 18 MM. Metric. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, $1 \frac{1}{32}$ inches. Stem diameter, $\frac{9}{32}$ inch. Stem length, $3 \frac{1}{8}$ inches. Valve lift, $\frac{5}{32}$ inch. Spring pressure, 45 pounds. Tappet clearance, .002-.003 inch. Inlet valves open at top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES. Head diameter, $1 \frac{1}{32}$ inches. Stem diameter, $\frac{9}{32}$ inch. Stem length, $3 \frac{1}{8}$ inches. Valve lift, $\frac{5}{32}$ inch. Spring pressure, 45 pounds. Tappet clearance, .003-.004 inch. Exhaust valves open 45 degrees before lower dead center and close 15 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.



AMERICAN AUSTIN

BANTAM MODEL—PRODUCTION STARTED MAY 1, 1930

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

NOTE. The top dead center position of piston No. 1 is marked on the flywheel by the mark '#1&4 T.D.C.' This is the opening point for the inlet valve in cylinder No. 1.

STARTER:—Model MAK-4001. Starter is connected to the engine through a special inboard Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter cranks the engine at 120 R.P.M. drawing 150 amperes at 3 volts. Brush spring tension is 27-43 ounces. Starter switch is Model SW-4204 (first cars), superseded by Model SW-4001.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.3 lb. ft.	3350	5.5	100
1.8 "	1925	5.0	200
3.3 "	1060	4.5	300
5.3 "	235	4.0	400
7.0 "	Lock	4.0	525

Mounting:—Starter is flange mounted at the left of the engine on the forward face of the flywheel housing. To remove starter, disconnect cable and take out two flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the starter bearing oilers every 5000 miles of operation.

GENERATOR:—Model GAS-4101. The direction of rotation is clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The third brush and brush mounting plate are held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 14 amperes at 8 volts reached at 2000 R.P.M. or 28-30 miles per hour.

Generator Data		
Amperes	Volts	R.P.M.
2	6.6	835
6	7.1	1000
10	7.25	1260
14	8.0	1925
12	7.75	2900

Shunt field current is 4.75-5 amperes at 6.5 volts. Motoring, generator draws 6.4 amperes at 6.35 volts. Brush spring tension is 30-36 ounces.

Mounting:—Generator is flange mounted at the front of the engine and is driven by helical gears from the camshaft drive gear. The gear mesh is adjusted by shims under the generator mounting bracket and these shims must be carefully removed and replaced whenever the generator is taken off the car. The distributor is mounted on the commutator end of the generator. To remove generator, disconnect lead and all ignition wiring or remove distributor. Then take out three flange mounting bolts. Pull the generator to the left to disengage the drive gear and lift from place.

NOTE. An adjustment is provided to mesh the generator drive gear and this should be done whenever the generator has been taken off the car. With the engine running, the three screws and the nut on the stud which hold the generator mounting bracket on the crankcase should be loosened and the weight of the generator supported by hand at the commutator end until the gears assume the proper running position. The three screws and the nut should then be tightened.

Oiling:—The bearing at the drive end of the generator is packed with grease and is oiled from the gear case. It requires no attention in service but should be repacked whenever the generator is disassembled. The commutator end bearing is fitted with a grease cup cast in the end plate. This should be refilled with No. 3 Keystone grease every year or each 10,000 miles of operation.

RELAY:—Model CB-4008. Relay is mounted on the dash. Relay contacts close at 10 M.P.H. or 875 R.P.M. when the generator voltage reaches 7-7.5 volts with a charging current of approximately 2 amperes and open at 6-7 M.P.H. or 600-650 R.P.M. with a discharge current of .5-2.5 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Briggs & Stratton Switch. Lighting switch is mounted on the instrument panel. Headlights are equipped with double filament bulbs. Headlight bulbs are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Lighting fuse mounted on the back of the switch is 20 ampere capacity.

BUICK

SERIES 8-50 EIGHT CYLINDER MODELS (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Delco-Remy, Model 13-DW or 13-DF (Export), or Exide 3-VXA-13-1, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 114 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the right frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 528-H. Coil is mounted on the top of the timing gear case at the right of the engine. Ignition current is 4 amperes at 6 volts with engine running and 6 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' type coincidental steering post and ignition switch lock.

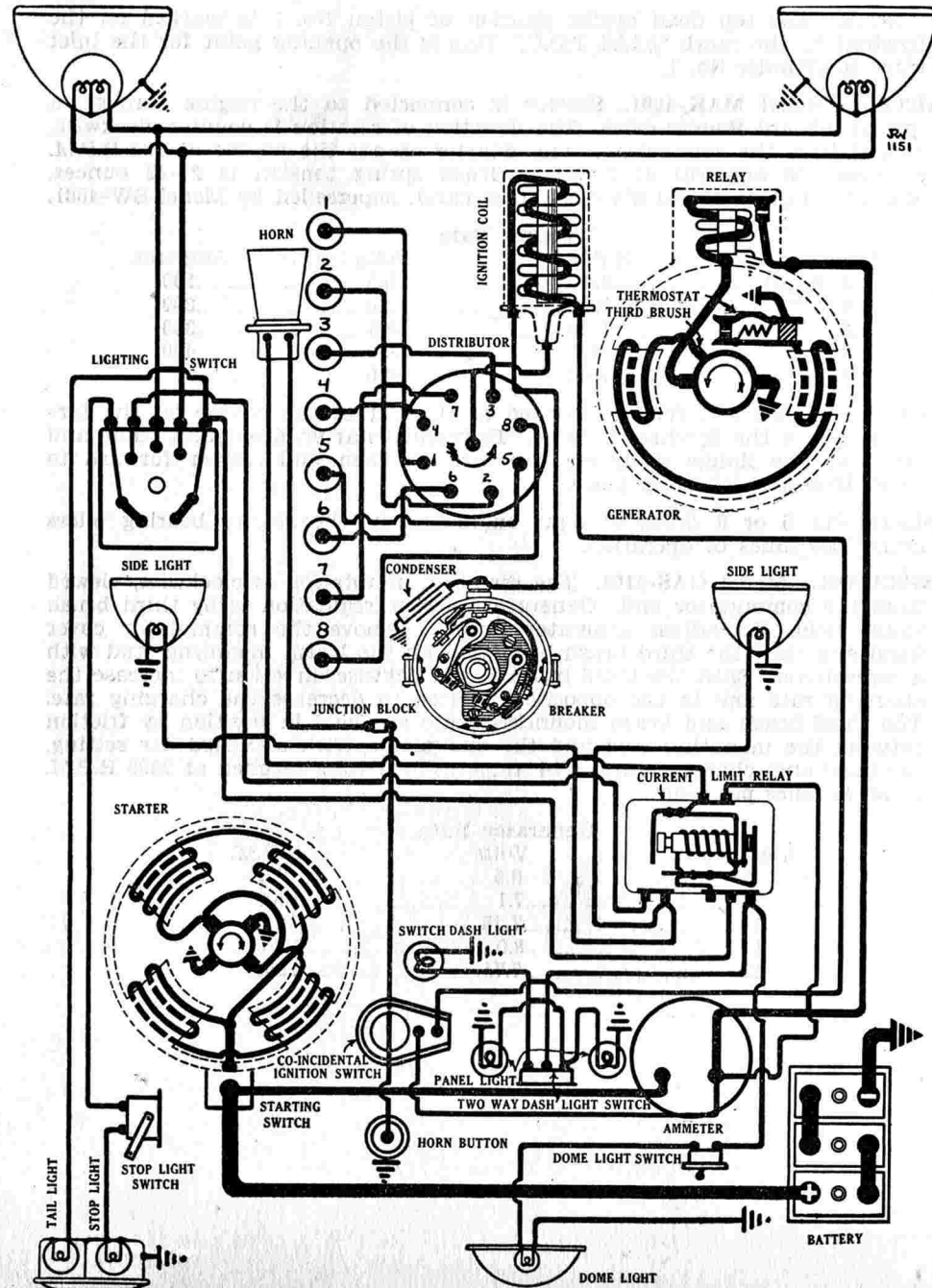
Distributor Model 660-L. Breaker contacts separate .018 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. The contact gap of the two sets of contacts must be exactly the same; this is important. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 24 degrees (engine). Manual advance is controlled by a spark button on the dash through a flexible cable control. Automatic advance begins at 400-480 R.P.M. (engine). Maximum automatic advance is 17-21 degrees (engine) reached at 1600 R.P.M. of the engine. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized to secure this firing interval for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the rear of the generator at the right of the engine. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Distributor bearings and drive gear are lubricated through a Zerk grease connection on the gear housing. Fill the Zerk fitting with cup grease until grease appears at the overflow at the top of the housing every two weeks or each 500 miles of operation. Every 2000 miles remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

Timing:—**Synchronization of Contacts.** Synchronize contacts on a rotary spark gap or use special Delco-Remy Tool, Part No. 1838182, and follow complete directions given in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over exactly 90 degrees to the firing position of piston No. 6 when the flywheel mark 'SYN/#6' will be directly opposite the indicator. Then loosen three lockscrews on movable sub-plate and turn eccentric adjusting screw until the second set of contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.022 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position 12 degrees before top dead center with the manual spark control fully advanced (pushed all the way in toward the dash). To set timing, crank engine over until piston No. 1 enters compression stroke. Remove cover in timing inspection hole in top face of flywheel housing at right of engine. Turn engine over until piston reaches a position 12 degrees before top dead center when the flywheel mark



BUICK

SERIES 8-50 EIGHT CYLINDER MODELS (1931) DELCO-REMY GENERATING STARTING SYSTEM DELCO-REMY IGNITION

'ADV/' will be directly opposite the indicator line at the edge of the inspection hole. Then loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted directly on the base plate) begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs in order 6-2-5-8-3-7-4 counter-clockwise around the distributor head.

The second set of contacts (mounted on the movable sub-plate) should begin to open 45 degrees after this point when the flywheel mark 'SYN/#6' is in line with the indicator.

Important Note:—The direction of the distributor rotation is now counter-clockwise, viewed from the top, which is reversed from 1930 models. This must be kept in mind in timing distributor and connecting spark plug cables.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18MM. Metric, AC Type J-12. Spark plug gaps are .025-.030 inch. Type J-9 plugs should be used if trouble is experienced with excessive heating or pre-ignition.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 5/16 inches. Stem diameter, 11/32 inch. Valve lift, .340 inch. Two valve springs are used. Spring pressure (inner spring) is 7.5-12.5 pounds (spring length, 1 13/16 inches) and 25-30 pounds (spring length, 1 15/32 inches); (outer spring) is 25-30 pounds (spring length, 1 15/16 inches) and 74-80 pounds (spring length, 1 19/32 inches). Tappet clearance or lash is .008 inch (hot). Inlet valves open 1½ degrees before top dead center and close 56½ after lower dead center.

EXHAUST VALVES. Head diameter, 1 3/16 inches. Stem diameter, 11/32 inch. Valve lift, .340 inch. Two valve springs are used. Spring pressure, (inner spring) is 7.5-12.5 pounds (spring length, 1 13/16 inches) and 25-30 pounds (spring length, 1 15/32 inches); (outer spring) is 25-30 pounds (spring length, 1 15/16 inches) and 74-80 pounds (spring length, 1 19/32 inches). Tappet clearance or lash is .008 inch (hot). Exhaust valves open 54½ degrees before lower dead center and close 30½ degrees after top dead center. Valve stem guides are removable.

STARTER:—**Model 725-N.** Starter is connected to the engine through a manual pinion shift and overrunning clutch. Pinion shift is interconnected with the starter switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
16 "	Lock	3	600

Mounting:—Starter is flange mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect starting pedal linkage and cable and take out flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at the commutator

end of the starter every month or each 1000 miles. The drive end bearing is oilless.

GENERATOR:—**Model 940-T-3.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the end plate (directly below the distributor gear housing). Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 18 amperes at 8.5 volts reached at 1450 R.P.M. or 25 miles per hour.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Shunt field current is 4-6.1 amperes at 6 volts. Generator, motoring, draws 5.5 amperes at 6 volts. Brush spring tension is 20-28 ounces.

Mounting:—Generator is mounted at the right of the engine on the rear of the timing gear case. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect all ignition wiring or remove distributor. Disconnect water pump drive coupling. Take out flange mounting screws. Then pull generator to the rear and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the generator every month or each 1000 miles of operation. The drive end bearing is oiled from the gear case.

RELAY:—**Model 265-B.** Relay is mounted on the generator. Relay contacts close at 8-10 M.P.H. when the voltage of the generator reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Lighting switch is mounted at lower end of steering column. Headlights are equipped with double filament bulbs using a second 21 cy. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Stop and backing light is 6-8 volt, 15 cp. S.C. Mazda 87. Side, dash, tail and instrument panel lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome light is 6-8 volt, 6 cp. S.C. Mazda 81. Pillar and tonneau lights when used are 6-8 volt, 3 cp. S.C. Mazda 63.

Switches:—Lighting switch is Model 486-L (Domestic) or 486-B (Right Hand Drive cars for Export). Stop light switch is Model 466-G. Backing light switch is Model 440-C.

CURRENT LIMIT RELAY:—**Model 410-G.** This is a vibrating circuit breaker connected in the lighting lines. It is mounted on the dash. Circuit breaker begins to vibrate when the current reaches 30-35 amperes and continues limiting the current to 5-18 amperes. Contact gap is .012-.030 inch. Air gap is .015-.025 inch. Plunger spring tension should be 5 ounces.

BUICK

SERIES 8-60, 8-80, 8-90 EIGHT CYLINDER MODELS (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—(Series 8-60) Delco-Remy, Type 13-EW (Domestic), 13-EF (Export), or Exide, Type 3-MXV-13-1, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 114 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours.

(Series 8-80, 8-90) Delco-Remy, Type 15-CW (Domestic), 15-CF (Export), or Exide, 3-MXV-15-1, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 133 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 24 hours. Battery is mounted on the right frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 528-H. Coil is mounted on the timing gear case at the right front of the engine. Ignition current is 4 amperes at 6 volts with engine running and 6 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' type co-incidental steering post and ignition switch lock.

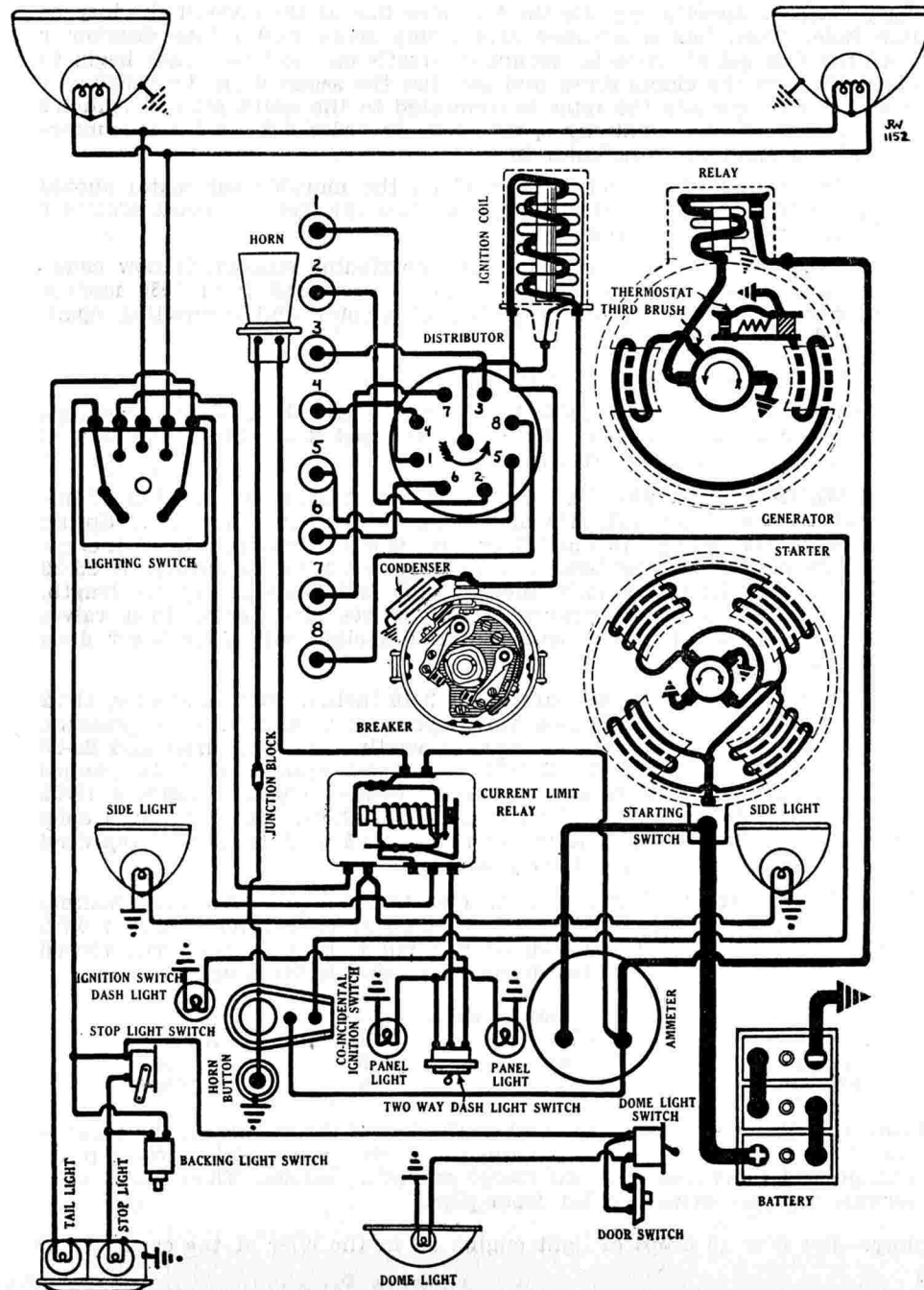
Distributor Model 660-E. Breaker contacts separate .018 inch. Set contact gap by loosening lock screw on stationary contact mounting plate (directly behind breaker arm) and turning eccentric adjusting screw. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 24 degrees (engine). Automatic advance begins at 400-480 R.P.M. of engine. Maximum automatic advance is 34 degrees reached at 3200 R.P.M. of engine. Manual spark control is controlled through a flexible cable by a spark button on the dash. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the rear of the generator at the right of the engine. To remove distributor, disconnect spark control wire and primary lead and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Distributor bearings and drive gear are lubricated through a Zerk grease connection on the gear housing. Fill the Zerk fitting with cup grease until grease appears at the overflow at the top of the housing every two weeks or each 500 miles of operation. Every 2000 miles remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Delco-Remy Tool, Part No. 1838182, and follow complete directions given in Equipment Section. Contacts can be synchronized after distributor has been timed to the engine by cranking engine over exactly 90 degrees from firing position of piston No. 1 when piston No. 6 will reach firing position with the flywheel mark 'SYN/#6' directly opposite the indicator line in the inspection hole. Then loosen three lock screws on movable sub-plate and turn eccentric adjusting screw until the second set of contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position 11 degrees (Series 8-60) or 10 degrees (Series 8-80, 8-90) before top dead center with the spark control button in the fully advanced position (pushed all the way in toward the



BUICK

SERIES 8-60, 8-80, 8-90 EIGHT CYLINDER MODELS (1931) DELCO-REMY GENERATING STARTING SYSTEM DELCO-REMY IGNITION

dash). To set timing, crank engine over until piston No. 1 enters compression stroke. Remove cover over timing inspection hole in top face of flywheel housing at right of engine and see that spark control button is fully advanced. Turn engine over until the flywheel mark 'ADV/' is directly opposite the indicator line on the edge of the inspection hole. This mark is 11 degrees (8-60) or 10 degrees (8-80, 8-90) before top dead center. Then loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted directly on base plate) begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs in order 6-2-5-8-3-7-4 counter-clockwise around the distributor head.

The second set of contacts (mounted on movable sub-plate) open exactly 45 degrees after this point with the flywheel mark 'SYN/#6' opposite the indicator line.

Important Note:—The direction of distributor rotation is reversed from 1930 models and is now counter-clockwise, viewed from the top. This must be kept in mind in timing distributor and connecting spark plug cables.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18 MM. Metric, AC Type J-12. Gaps are .025-.030 inch. Type J-9 spark plugs should be used if trouble is experienced with overheating or pre-ignition.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 13/32 inches (8-60), 1 5/8 inches (8-80, 8-90). Stem diameter, .3715 inch. Valve lift, .340 inch. Tappet clearance or lash, .008 inch (hot). Spring pressure, 38-49 pounds (valve closed), 129-143 pounds (valve open). Inlet valves open 1 1/2 degrees before top dead center and close 56 1/2 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 9/32 inches (8-60), 1 7/16 inches (8-80, 8-90). Stem diameter, .3695 inch. Valve lift, .340 inch. Tappet clearance or lash, .008 inch (hot). Spring pressure, 38-49 pounds (valve closed), 129-143 pounds (valve open). Exhaust valves open 54 1/2 degrees before lower dead center and close 30 1/2 degrees after top dead center.

Note:—Valves are fitted with two springs; an inner spring with a spring pressure of 11.5-16.5 pounds (spring length, 1 21/32 inches), or 49-55 pounds (spring length, 1 5/16 inches) and an outer spring with a spring pressure of 28-32 pounds (spring length, 1 15/16 inches), or 82-89 pounds (spring length, 1 19/32 inches).

STARTER:—**Model 725-L.** Starter is connected to the engine through a manual pinion shift and an overrunning clutch. Pinion shift is interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
16 "	Lock	3	600

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and pedal linkage and take out flange mounting screws. Then pull starter forward to clear drive and lift starter from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles. The two bearings on the drive end are oilless.

GENERATOR:—**Model 940-T-2.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the end plate (directly below the distributor gear housing). Then shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 18 amperes at 8.5 volts reached at 1450 R.P.M. or 25 miles per hour.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.35-8.5	1450	9-12	7.35-7.65	1800-2000
Shunt field current is 4-6.1 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts. Brush spring tension is 20-28 ounces.					

Mounting:—Generator is mounted at the right of the engine on the rear of the timing gear case. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect all ignition wiring or remove distributor. Disconnect water pump drive coupling. Take out flange mounting screws. Then pull generator to the rear and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the generator every month or each 1000 miles of operation. The drive end bearing is oiled from the timing gear case.

RELAY:—**Model 265-B.** Relay is mounted on the generator. Relay closes at 8-10 M.P.H. when the generator voltage reaches 6.75-7.5 volts and opens with a discharge current of 0-2.5 amperes. Charging current is 2 amperes at closing of contacts. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Lighting switch is mounted at lower end of steering column. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Stop and backing light is 6-8 volt, 15 cp. S.C. Mazda 87. Side, dash, tail and instrument panel lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome light is 6-8 volt, 6 cp. S.C. Mazda 81. Pillar and tonneau lights (when used) are 6-8 volt, 3 cp. S.C. Mazda 63.

Switches:—Lighting switch is Model 486-L (Domestic) or 486-M (8-60 Right Hand Drive for Export) or 486-B (8-80, 8-90 Right Hand Drive for Export). Stop light switch is Model 466-G. Backing Light switch is Model 440-C.

CURRENT LIMIT RELAY:—**Model 410-G.** This is a vibrating circuit breaker mounted on the dash and connected in the lighting circuits to protect them from overload and short-circuits. Circuit Breaker begins to vibrate when the current reaches 30-35 amperes and continues limiting the current to 5-18 amperes. Contact gap is .015-.025 inch with contacts closed. Plunger spring tension should be 5 ounces.

CADILLAC

SERIES 355—SERIAL NUMBERS 800-001 UP
PRODUCTION STARTED OCTOBER, 1930
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

BATTERY:—Delco, Type 15-CW, 6 volt, 120 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 120 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 24 hours. Battery is mounted under the right front seat.

IGNITION:—Coil Model 530-B. Coil is mounted on the radiator brace rods directly over the distributor. Ignition current is 2.5 amperes with engine running and 2 amperes with engine stopped.

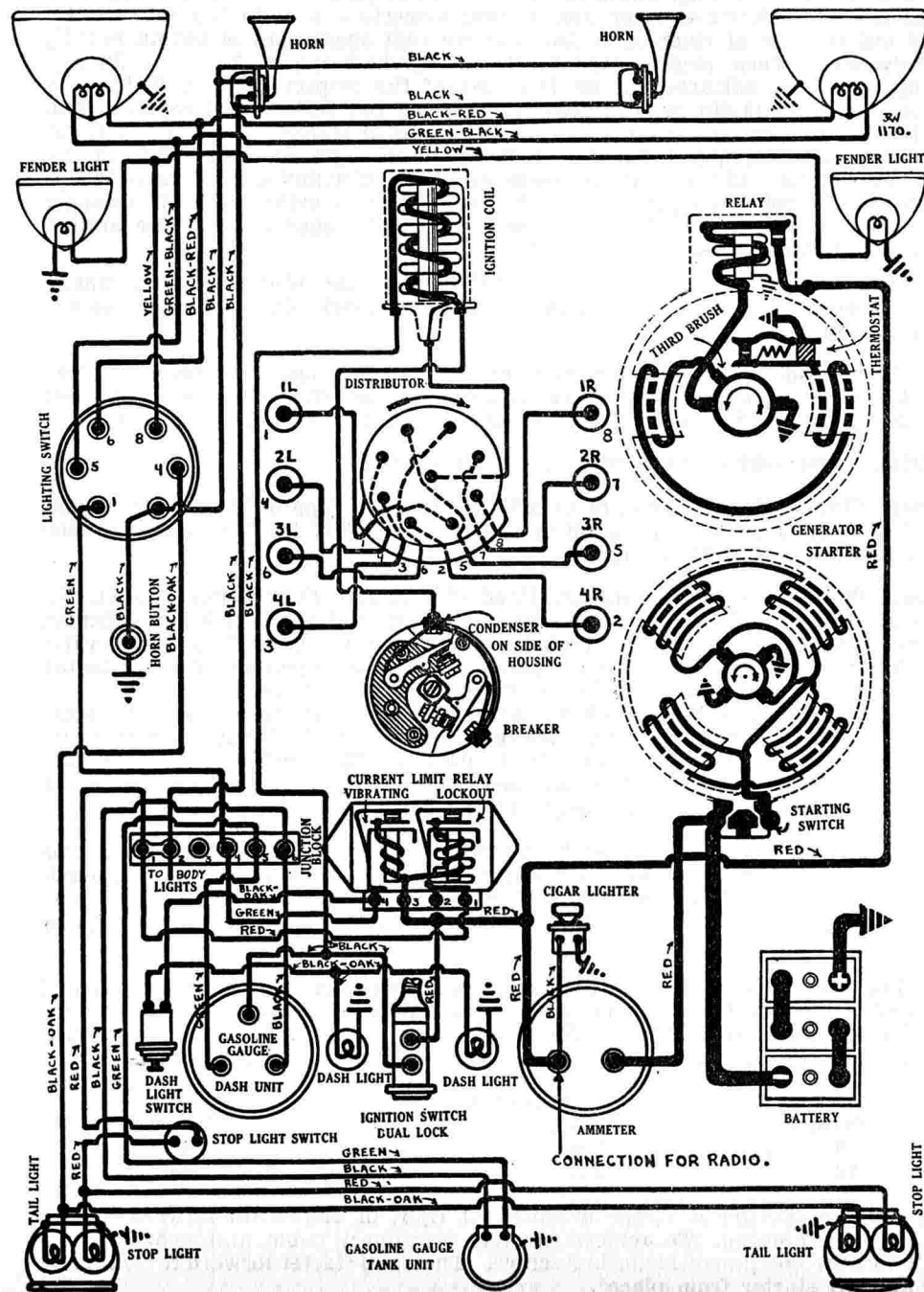
Distributor Model 4055. Breaker contacts separate .018-.022 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until correct gap is secured with breaker arm on lobe of cam. Tighten the lock nut. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 40 degrees (engine). Automatic advance begins at 1000 R.P.M. (engine). Maximum automatic advance is 30 degrees reached at 3800 R.P.M. Breaker has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized for correct performance. See Timing. Ignition switch is Delco-Remy Dual Lock Model 426-P.

Mounting:—Distributor is mounted at the front of the engine between the cylinder blocks. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out two hold-down screws and lift distributor from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor housing every 1000 miles of operation. At the same time put a drop of oil on the breaker arm pivot pins and in the hole drilled in the top of the breaker cam which oils the path of the breaker arm rubbing blocks on the face of the cam.

Timing:—Synchronization of Contacts. The interval between the opening of the two sets of contacts must be exactly 45 degrees (distributor). This can be set by using special Delco-Remy Tool, Part No. 822572 and following directions on Distributors in Equipment Section. The breakers may be synchronized without use of the tool after the distributor has been timed to the engine by cranking the engine over 90 degrees from the firing position of piston No. 1 when the flywheel mark 'IG/A-2-6' will be opposite the indicator. If the second set of contacts does not open at this point, the lock screws on the breaker arm mounting plate should be loosened and the eccentric adjusting screw turned until the contacts begin to open. Then tighten the lock screws and check the contact gap.

Timing Distributor to Engine:—Breaker contacts begin to separate when the piston entering power stroke reaches a position $\frac{7}{8}$ inch (on the flywheel) before top dead center with the manual spark control in the fully advanced position. With piston No. 1 in firing position the flywheel mark 'IG/A-1-5' will be opposite the indicator on the flywheel case. This mark is $\frac{7}{8}$ inch before the top dead center position of the piston. To set timing, crank engine over until piston No. 1 reaches firing position. Fully advance manual spark control. Then loosen taper screw in center of breaker cam and rotate cam until the set of contacts mounted on the stationary breaker plate begin to open. Tighten the screw and check to see that segment directly opposite rotor is connected to the spark plug in cylinder No. 1. The second set of contacts open exactly 45 degrees after this point.



CADILLAC

SERIES 355—SERIAL NUMBERS 800-001 UP
PRODUCTION STARTED OCTOBER 1930
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

Firing Order:—The firing order is 1L-4R-4L-2L-3R-3L-2R-1R. Cylinder banks are right and left as viewed from the driver's seat. No. 1 cylinder is nearest the radiator.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-10. Gaps are .025-.028 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1.660-1.666 inch. Stem diameter, $\frac{3}{8}$ inch. Stem length, 6 $\frac{17}{64}$ inches. Valve lift, 23/64 inch. Spring pressure, 79 pounds (spring length, 2 $\frac{1}{2}$ inches) or 160 pounds (spring length, 2.148 inches). Tappet clearance, .004 inch (hot). Inlet valves open 9 degrees before top dead center and close 58 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1.634-1.640 inches. Stem diameter, $\frac{3}{8}$ inch. Stem length, 6 $\frac{1}{4}$ inches. Valve lift, 23/64 inch. Spring pressure, 79 pounds (spring length, 2 $\frac{1}{2}$ inches) and 160 pounds (spring length, 2.148 inches). Tappet clearance, .006 inch (hot). Exhaust valves open 46.5 degrees before lower dead center and close 7 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 728-D.** Starter is connected to the engine through a manual pinion shift interconnected with the starting switch and an overrunning clutch. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3	600

Mounting:—Starter is mounted at right of engine on rear of flywheel case. To remove starter, disconnect cable and starting pedal linkage and take out three flange mounting cap screws. Then pull starter to rear to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in each starter oiler every 1000 miles. Every six months repack the reduction gear housing with graphite grease.

GENERATOR:—**Model 927-D.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at approximately 165°F. cutting the resistance in series with the field and reducing the output 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw in the end plate. Then shift the third brush mounting plate by hand. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the oppo-

site direction to decrease the charging rate. Tighten the screw after making the adjustment. The maximum standard charging rate is 10-12 amperes (hot) at 7.3-7.7 volts reached at 1600 R.P.M. or 25 miles per hour.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.2-8.6	1450	10-12	7.3-7.7	1600

Brush spring tension is 16-20 ounces. Generator field current is 1.8-2.3 amperes at 6 volts.

Mounting:—Generator is flange mounted at right of engine on the rear of the chain case. The water pump is mounted on the front face of the chain case. To remove generator, disconnect lead and drop mud pan at right of engine. Then remove nuts on two upper flange mounting bolts and take out lower flange mounting cap screw. Pull generator to the rear to disengage drive coupling. The generator can then be taken out from underneath the car.

Drive Chain Adjustment:—To adjust generator and water pump drive chain, loosen two pivot screws and nuts on flange mounting. Then force water pump away from engine until chain is tight. Then back off approximately $\frac{1}{8}$ inch and tighten mounting screws and nuts.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 500 miles of operation.

RELAY:—**Model 266-N.** Relay is mounted on the generator. Relay closes at 420 R.P.M. or 8-10 miles per hour when the generator voltage reaches 7.5 volts and opens with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.021 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—**Switch Model 486-H.** Lighting switch is mounted at lower end of the steering column. Double filament headlights using the second 21 cp. filament instead of dimmers are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights or parking lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome and corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

CURRENT LIMIT RELAY:—**Model 5759.** This device consists of a vibrating and lockout circuit breaker mounted on the dash. The vibrating unit protects the lighting circuits. It starts to operate when the current reaches 25-30 amperes and continues limiting the current to 5-15 amperes. The lockout circuit breaker protects the horn, stop light, inspection light, cigar lighter and body light circuits. It begins to operate when the current reaches 25-30 amperes and continues limiting the current to less than 1 ampere. Contact gap is .012-.030 inch. Air gap between armature and coil core is .015-.025 inch. Plunger spring tension is 5 ounces.

**V-12 SERIES 370 SERIAL NUMBERS 1000-001 UP
PRODUCTION STARTED OCTOBER 1930
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION**

IGNITION:—Coil Model 530-G (2 used). Ignition coils are mounted in a recess in the top tank of the radiator directly above the distributor. Ignition current (each coil) is 2 amperes at 6 volts with engine running and 2.5 amperes at 6 volts with engine stopped. The ignition switch is a Delco-Remy Dual Lock.

Mounting:—Distributor is mounted at the front of the engine between the cylinder banks. To remove the distributor, disconnect the primary leads and manual spark control and remove the distributor head with cables intact. Then take out two hold-down screws and lift the distributor from place.

Timing:—Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches a position $1\frac{27}{32}$ inches (on the flywheel) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke and stop when the mark 'C/2-12' on the flywheel is directly in line with the indicator on the flywheel case. Then turn engine over slowly until the ignition mark for cylinder No. 1 'IG/A' (which is $3\frac{11}{16}$ inches after the mark 'C/2-12') is directly opposite the indicator. See that manual spark control is fully advanced (spark control button pushed all the way in toward the dash) and that the distributor housing is rotated counter-clockwise to the full limit of the stop screw slot. Then loosen the lock screw in the center of the breaker cam and carefully locate the cam so that the right hand contacts are beginning to open with the rotor terminal (which is connected to the high tension terminal in the center of the distributor head) directly opposite No. 1 segment in the distributor head (see diagram).

CADILLAC

V-12 SERIES 370 SERIAL NUMBERS 1000-001 UP
PRODUCTION STARTED OCTOBER, 1930
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

that the right hand (stationary set of contacts) just open with the pointer on the farthest indicating point on the quadrant. The second set of contacts (mounted on the movable plate) should begin to open when the pointer is opposite the mark '12 L.H.' on the quadrant. If the contacts do not open at this point, loosen the lock screws on the movable breaker plate and shift the plate until the contacts begin to open. The right hand contacts begin to open again when the pointer is opposite the '12 R.H.' mark. These distances are $37\frac{1}{2}$ and $22\frac{1}{2}$ degrees (distributor) respectively. The synchronization of the contacts can be checked after the distributor has been timed to the engine by cranking the engine over until piston No. 4 reaches firing position. This point is 75 degrees on the flywheel after the firing position of piston No. 1 when the second set of contacts should begin to open.

Firing Order:—The firing order is 1-4-9-8-5-2-11-10-3-6-7-12 with spark plugs numbered as shown on the diagram. The firing order in conventional terms is 1L-2R-5L-4R-3L-1R-6L-5R-2L-3R-4L-6R with number 1 cylinder nearest the radiator and the cylinder banks right and left as viewed from the driver's seat.

Spark Plugs:—Spark plugs are 18 MM. Metric A.C. Type G-8. Gaps are .025-.028 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1.446-1.452 inches. Stem diameter, .3392-.3397 inch. Stem length, 6 $\frac{1}{16}$ inches. Valve lift, $\frac{11}{32}$ inch. Spring pressure, 65 pounds (valve closed) and 130 pounds (valve open). Inlet valves open at top dead center and close 44 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1.446-1.452 inches. Stem diameter, .3392-.3397 inch. Stem length, 6 $\frac{1}{16}$ inches. Valve lift, $\frac{11}{32}$ inch. Spring pressure, 65 pounds (valve closed) and 130 pounds (valve open). Exhaust valves open 39 degrees before lower dead center and close 5 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

SPECIAL NOTE:—A special automatic valve tappet take-up is used. The rocker arm is mounted on an eccentric bushing which is rotated to take up all valve lash by a spring under the plunger which bears on an arm of the eccentric. The plunger operates in an oil cylinder. This device requires no attention in service and there will be no appreciable tappet clearance or valve lash. It is reset when a valve is replaced by using a special combination screwdriver and wrench, Cadillac Part No. 109627-T, and adjusting the clearance to .030 inch with the plunger held down at the bottom of the dashpot. This adjustment should be made with the engine running and a special tool, Cadillac Part No. 109624, must be used to hold the plunger down at the end of the stroke.

STARTER:—Model 457. Starter is connected to the engine through a set of reduction gears and an overrunning clutch. The manual pinion shift is interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	4	60
19 "	Lock	3	500

Mounting:—Starter is flange mounted at the right of the engine on the rear of the flywheel housing. To remove starter, lift up floor of front compartment, disconnect cable and leads at starting switch and disconnect starting pedal linkage at the shifter yoke. Then take out three flange mountig cap

screws. Pull starter to the rear to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the drive end of the starter every 1000 miles. Every six months repack the reduction gear case with medium grease.

GENERATOR:—Model 927-D. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40 per cent. To adjust the generator output, remove the commutator cover band and loosen the small round headed lock screw on the outside of the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. The maximum standard charging rate is 10-12 amperes (hot) reached at 1600 R.P.M. or 25 miles per hour.

Generator Data

Cold Test		Hot Test	
Amperes	Volts	Amperes	Volts
18-20	8.2-8.6	10-12	7.3-7.7
	1450		1600

Brush spring tension is 16-20 ounces. Shunt field current is 1.8-2.3 amperes at 6 volts.

Mounting:—Generator is flange mounted at the right of the engine on the rear of the timing chain case. To remove generator, disconnect lead and take out three flange mounting cap screws. Then slide generator to the rear to disengage coupling and lift from place. The water pump is driven by an extension of the generator shaft and it will be necessary to disconnect water pump coupling before the generator can be removed.

Timing Chain Adjustment:—Timing chain tension is adjusted by shifting the generator. To take up timing chain, loosen the three mounting screws and pry the generator away from the engine as far as possible. Then back off $\frac{1}{8}$ inch and tighten the mounting screws. The chain should run noiselessly with the correct adjustment.

Oiling:—Put 8 or 10 drops of light engine oil in the generator oilers every 1000 miles.

RELAY:—Model 266-N. Relay is mounted on the left body sill under the dash. Relay contacts close at 420 R.P.M. (generator) or 8-10 M.P.H. when the generator voltage reaches 7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 486-D. Lighting switch is mounted at the lower end of the steering column and is controlled by a lever on the steering wheel. Double filament headlight bulbs are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome and corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

CURRENT LIMIT RELAY:—Model 5759. This device consists of two circuit breakers mounted on the dash. A vibrating circuit breaker is connected in the lighting circuits. It begins to operate when the current reaches 25-30 amperes and continues limiting the current to 5-15 amperes. The lockout circuit breaker is connected in the stop light and body light circuits. It opens the circuit when the current reaches 25-30 amperes limiting the current to less than 1 ampere. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed.

CADILLAC

MODEL V-16 SERIES 452 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Exide, Type 3-XC-RV-21-2G. 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 137 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 26 hours. Battery is mounted on the right frame member under the dust shield.

IGNITION:—Coil Model 530-H (2 used). Coils are mounted in a recess in the top tank of the radiator. Ignition current is 2 amperes at 6 volts with engine running and 2.5 amperes at 6 volts with engine stopped (each coil). The ignition switch is a Delco-Remy Dual-Lock. Model 426-M or L (R.H.D.).

Distributor Model 4057. Breaker contacts separate .014-.018 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 38 degrees (engine). Automatic advance begins at 1100 R.P.M. Maximum automatic advance is 24 degrees (engine). Breaker has two sets of contacts operating on a single eight sided cam. Each set of contacts controls one ignition coil and fires the spark plugs in eight cylinders. Contacts open alternately at intervals of $22\frac{1}{2}$ degrees corresponding to the 45 degree firing interval of the engine. The firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

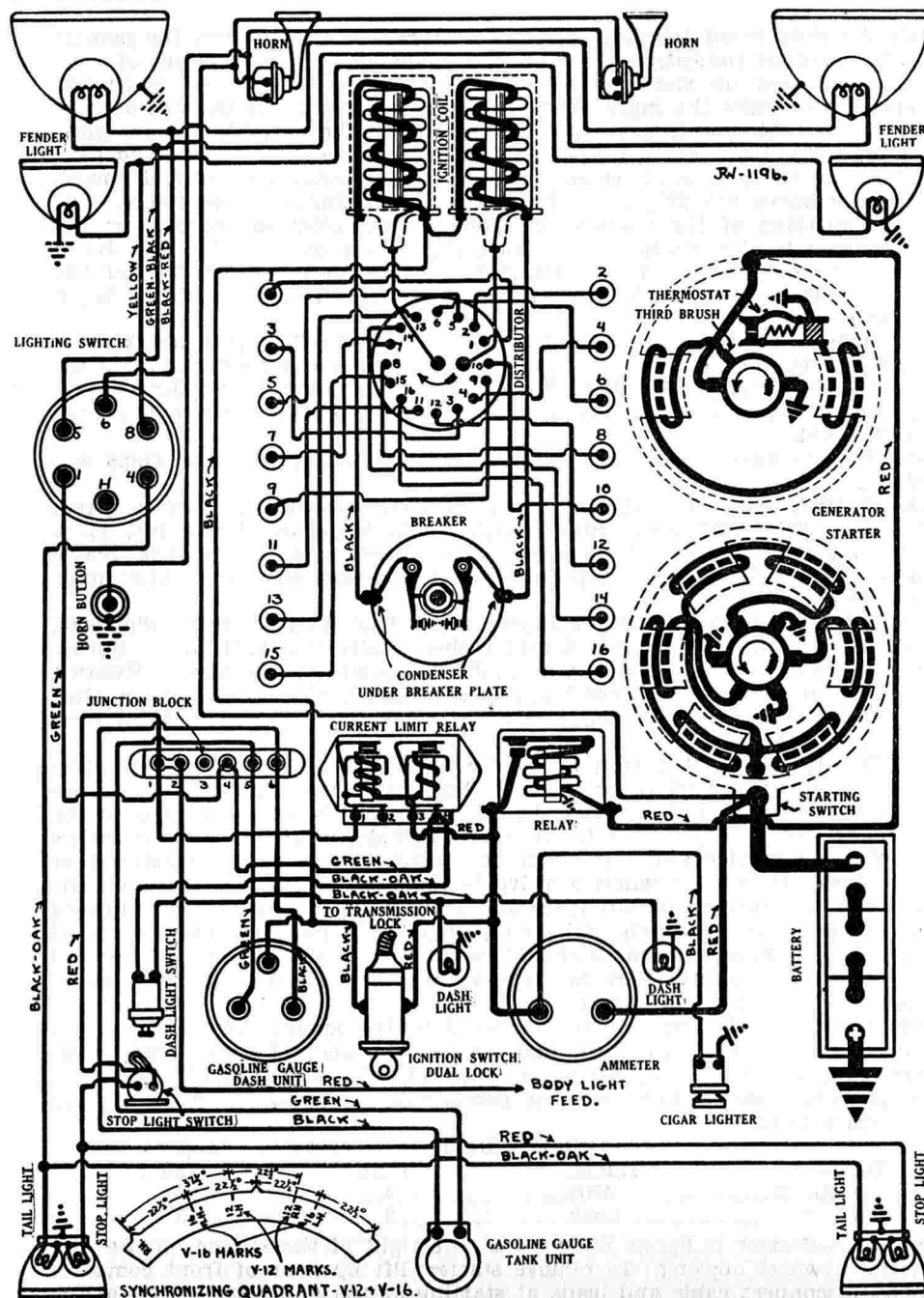
Mounting:—Distributor is mounted between the cylinder banks at the front of the engine. To remove distributor, disconnect primary leads and manual advance rod and remove distributor head with cables intact. Then take out two hold-down screws and lift distributor from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor every 1000 miles. At the same time remove the distributor head and rotor and put 2 or 3 drops of oil in the hole drilled in the top of the cam. This oiler oils the breaker arm rubbing blocks on the face of the breaker cam.

Timing:—**Timing Distributor to Engine.** Breaker contacts begin to separate when the piston entering power stroke reaches a position 10.5 degrees (on the flywheel) before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until No. 1L piston enters compression stroke (the up stroke with both valves closed). Fully advance the spark control lever. Crank engine over until the flywheel mark 'IG/A' which is $10\frac{1}{2}$ degrees or $1\frac{1}{4}$ inches on the flywheel before the top dead center mark 'C/1-15' is opposite the indicator. Then loosen the taper lock screw in the center of the breaker cam and carefully locate cam so that one set of breaker contacts are beginning to open. Tighten the lock screw and see that the segment in the distributor directly opposite the rotor is connected to the spark plug in cylinder No. 1L. Connect the remaining spark plugs in accordance with the diagram. The firing order and numbering of the cylinders is given in accordance with Cadillac specifications.

Synchronization of Contacts. Contacts can be synchronized on a rotary spark gap or directly on the engine after the distributor has been timed to the engine by cranking engine over 45 degrees when piston No. 4R (No. 8) will reach firing position. If the second set of contacts do not separate at this point loosen the lock screws on the movable sub-plate and shift position of plate until contacts begin to open. Tighten the lock screws and check the contact gap with breaker arm on lobe of cam.

Firing Order:—The firing order is 1-8-9-14-3-6-11-2-15-10-7-4-13-12-5-16 with spark plugs numbered as shown on the diagram. This firing order in con-



CADILLAC

MODEL V-16 SERIES 452 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

ventional terms is 1L-4R-5L-7R-2L-3R-6L-1R-8L-5R-4L-2R-7L-6R-3L-8R with number 1 cylinder nearest the radiator and cylinder banks right and left as viewed from the driver's seat.

NOTE:—The distributor is of the 'side outlet type' with the coil high tension leads and all spark plug cables arranged in two tiers or decks across the rear of the distributor cap. Connections from left to right (facing toward the front of the car) are as follows:

Upper Deck—R.H. Coil Lead—3-1-14-9-4-12-16-8.

Lower Deck—L.H. Coil Lead—7-11-2-5-10-6-15-13.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-10. Gaps are .025-.028 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1.446-1.452 inches. Stem diameter, .3392-.3397 inch. Valve length, 6 1/16 inches. Valve lift, 11/32 inch. Spring pressure, 65 pounds (valve closed), 130 pounds (valve open). Inlet valves open at top dead center and close 44 degrees after lower dead center. The flywheel is marked 'C/1-15' at point of inlet opening for cylinders Nos. 1L and 8L.

EXHAUST VALVES. Head diameter 1.446-1.452 inches. Stem diameter, .3392-.3397 inch. Valve length, 6 1/16 inches. Valve lift, 11/32 inch. Spring pressure, 65 pounds (valve closed), 130 pounds (valve open). Exhaust valves open 39 degrees before lower dead center and close 5 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

SPECIAL NOTE:—A special automatic valve tappet take-up is used. The rocker arm is mounted on an eccentric bushing which is rotated to take up all valve lash or clearance by a spring under the plunger which bears on an arm of the eccentric. The plunger operates in an oil cylinder. This device requires no attention in service and there will be no appreciable tappet clearance or valve lash. It is reset whenever a valve is replaced by using a special combination screwdriver and wrench, Cadillac Part No. 109627-T, and adjusting the clearance to .030 inch with the plunger held down at the bottom of the dashpot. This adjustment must be made with the engine running and a special tool, Cadillac Part No. 109624, must be used to hold the plunger down at the end of the stroke.

STARTER:—**Model 457.** Starter is connected to the engine through a set of reduction gears and an overrunning clutch. The manual pinion shift is interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	4	60
19 "	Lock	3	500

Mounting:—Starter is flange mounted at right of engine on rear of flywheel housing. To remove starter, take up floor boards of front compartment and disconnect cable and leads at starting switch. Disconnect pedal rod at shifter yoke and take out three mounting cap screws. Then pull starter to rear to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the drive end of

the starter every 1000 miles. Every six months repack the reduction gear case with medium grease.

GENERATOR:—**Model 927-K.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, loosen the small round headed screw on the end plate and remove the commutator cover band. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 18-20 amperes at 8.6 volts reached at 1400 R.P.M. or 23 M.P.H.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.2-8.62	1450	10-12	7.3-7.7	1600

Brush spring tension is 16-20 ounces. Shunt field current is 1.8-2.3 amperes at 6 volts.

Mounting:—Generator is flange mounted at right of engine on rear of timing chain case. To remove generator, disconnect lead and water pump drive coupling. Take out three flange mounting cap screws. Pull generator to the rear to disengage drive coupling and lift from place.

Timing Chain Adjustment. Timing chain is adjusted by shifting the generator. To take up timing chain, loosen the three mounting screws and pry the generator away from the engine as far as possible. Then back off 1/8 inch and tighten the mounting screws. With correct adjustment, the chain should run noiselessly.

Oiling:—Put 8 or 10 drops of light engine oil in the generator oilers every 500 miles of operation.

RELAY:—**Model 266-E.** Relay is mounted on the left body sill under the dash. Relay contacts close at 420 R.P.M. (generator) when the generator voltage reaches 7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—**Delco-Remy Switch Model 486-H.** Lighting switch is mounted at lower end of steering column. Double filament headlights using a second 21 cp. filament instead of dimmers are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights (on fenders) are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome and corner lights are 6-8 volt, 3 cp. Mazda 63.

CURRENT LIMIT RELAY:—**Model 5759.** This device consists of two circuit breakers mounted on the dash. A vibrating circuit breaker is connected in the lighting circuits. It begins to operate when the current reaches 25-30 amperes and continues limiting the current to 5-15 amperes. The lockout circuit breaker is connected in the stop light and body light circuits. It begins to operate with a current of 25-30 amperes and limits the current to less than 1 ampere. Contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed.

CHEVROLET

INDEPENDENT MODEL SERIES AE (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Various types of batteries have been used. They are all six volt. The negative (—) terminal is grounded. Lighting capacity (5 ampere rate) is 5 amperes for 18 hours. Battery is mounted on the right frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 528-C. Coil is mounted on the front of the dash. Ignition current is 1.9 amperes at 7.5 volts with engine running at 40 M.P.H. and 4 amperes at 6 volts with engine stopped. The ignition switch is a Delco-Remy Electrolock, Type 427-H. The Electrolock must be removed as a unit with the distributor whenever the distributor is taken off the car. This Electrolock is fully described in the Equipment Section.

Distributor Model 633-G. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 13 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 35 degrees reached at 2400 R.P.M.

Mounting:—Distributor is mounted at right of engine and is driven by an inclined shaft from the camshaft. To remove distributor, disconnect Electrolock at dash, disconnect manual advance rod and remove distributor head with cables intact. Then loosen advance arm stop screw and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one half turn every month or each 1000 miles. At the same time remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil. Put a small bit of vaseline on the face of the breaker cam.

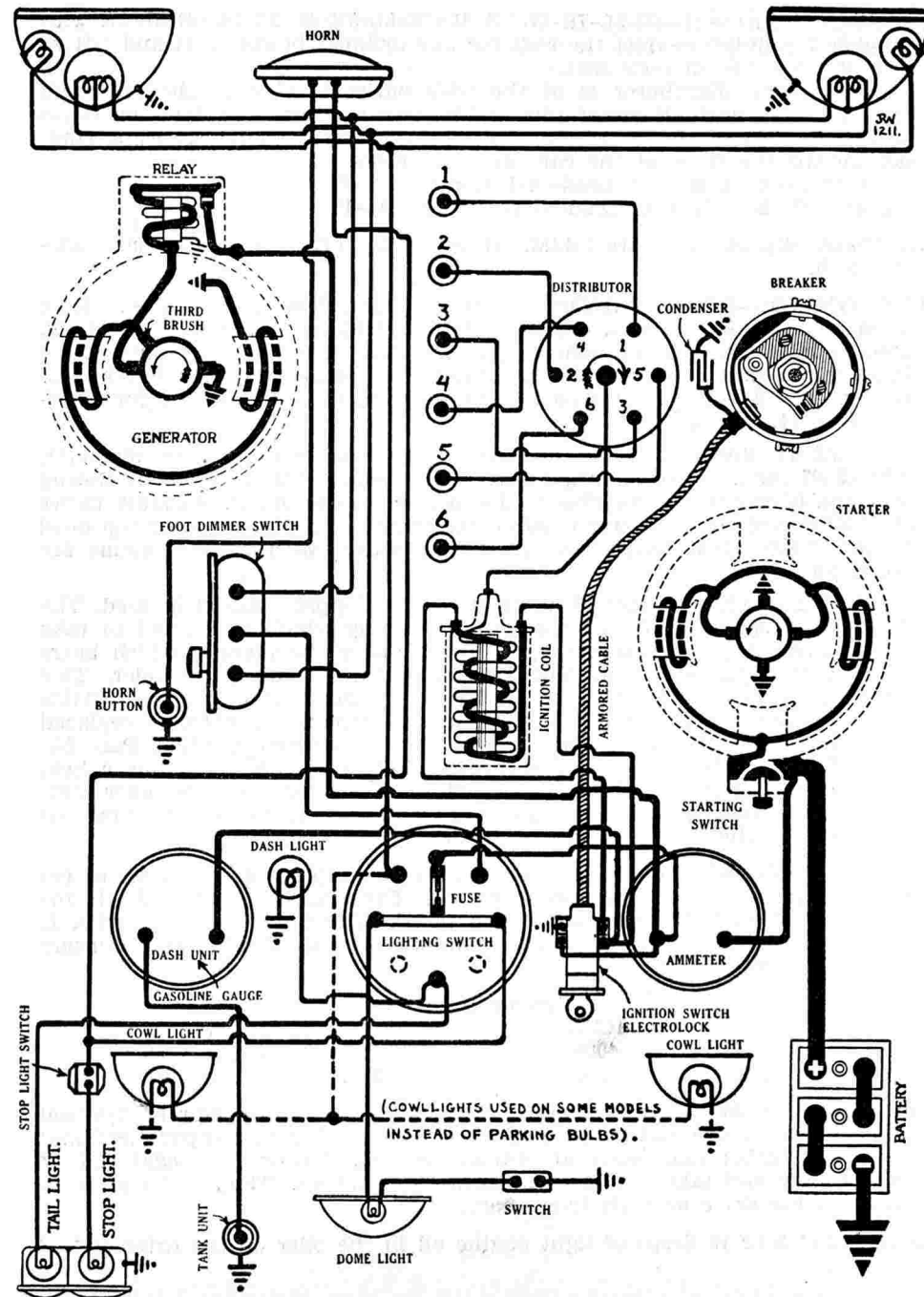
Timing:—Breaker contacts begin to separate when the piston entering power stroke reaches a position 12 degrees (on the flywheel) before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance spark control and see that distributor is rotated counter-clockwise to the full extent of the advance arm slot. Turn engine over until the '12' mark on the flywheel will be opposite the indicator in the peep hole in the front face of the flywheel housing at the right of the engine. This is the firing position of No. 1 piston. Then loosen advance arm clamp screw and rotate distributor until breaker contacts begin to open. Tighten the clamp screw and check rotor position. The rotor must be directly opposite the segment connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs in order 5-3-6-2-4 clockwise around the distributor head.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type 140. Gaps are .025 inch.

VALVE TIMING: INLET VALVES. Head diameter, 1 29/64 inches. Stem diameter, 5/16 inch. Stem length, 4 23/32 inches. Valve lift, .277 inch. Spring pressure, 40 pounds. Tappet clearance, .006 inch (hot). Inlet valves open 4 degrees after top dead center and close 42 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, 1 11/32 inches. Stem diameter, 5/16 inch. Stem length, 4 23/32 inches. Valve lift, .277 inch. Spring pressure, 40 pounds. Tappet clearance, .008 inch (hot). Exhaust valves open 47 degrees



CHEVROLET

INDEPENDENT MODEL SERIES AE (1931) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

before lower dead center and close 4 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model 714-L. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 26 ounces. Starter cranks engine at 160 R.P.M. drawing 150 amperes at 4.2 volts. The starting switch is mounted on the starter field frame and is operated by a pedal on the toeboard.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5	65
14 "	Lock	3.63	475

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out the flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the starter every month or each 1000 miles.

GENERATOR:—Model 943-J. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, loosen the small round headed screw on the end plate and remove the commutator cover band. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting the maximum charging rate is 18 amperes (cold) reached at 1700 R.P.M. or 25 miles per hour.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
17-18	8.2	1700	12	7.7	1800

Motoring, generator draws 3 amperes at 6 volts. Shunt field current is 4.5-9 amperes at 6 volts. Brush spring tension is 16 ounces.

Mounting:—Generator is mounted at left of engine by special hinge bracket and is driven by the fan belt. To remove generator, disconnect lead and remove cap screw in adjustment clamp at front of generator. Then swing generator toward engine and slip off drive belt. Then take out bolts holding generator on bracket and lift generator from place.

Fan Belt Adjustment. Fan belt tension is adjusted by loosening clamp screw on adjustment arm at front of generator and swinging generator away from the engine. The belt tension should be just sufficient to drive fan and generator without slipping. Any excessive belt tension will cause wear in the generator bearings.

Oiling:—Put 8 or 10 drops of light oil in the oiler at each end of the generator every month or each 1000 miles.

RELAY:—Model 265-H. Relay is mounted on the generator. Relay contacts close at 750 R.P.M. or 7.5 miles per hour when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 478-E. Lighting switch is mounted on the dash. Double filament headlight bulbs are standard equipment using a second 21 cp. filament instead of dimmers. Headlights are controlled by a foot switch mounted on the toeboard. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Dimmer lights or parking lights in headlights are 6-8 volt, 3 cp. S.C. Mazda 63. Side lights (used on some models) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash, tail and dome lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87.

Dimmer switch mounted on toe board is Delco-Remy Model 465-H. Stop light switch is Model 466-M.

FUSES:—Lighting fuse mounted on back of lighting switch is 15 ampere capacity.

CHRYSLER SIX

SERIES CM (1931) AFTER SERIAL NUMBER 0,520,501

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-1-13. 6 volt, 84 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 16.8 hours. Battery is mounted on the left frame member.

IGNITION:—Coil Model 526-T. The ignition switch is built in the base of the coil. Coil is mounted on the rear of the dash with the ignition switch extending through to the face of the instrument board. Ignition current is 1.5 amperes at 6 volts with engine running and 5 amperes at 6 volts with engine stopped.

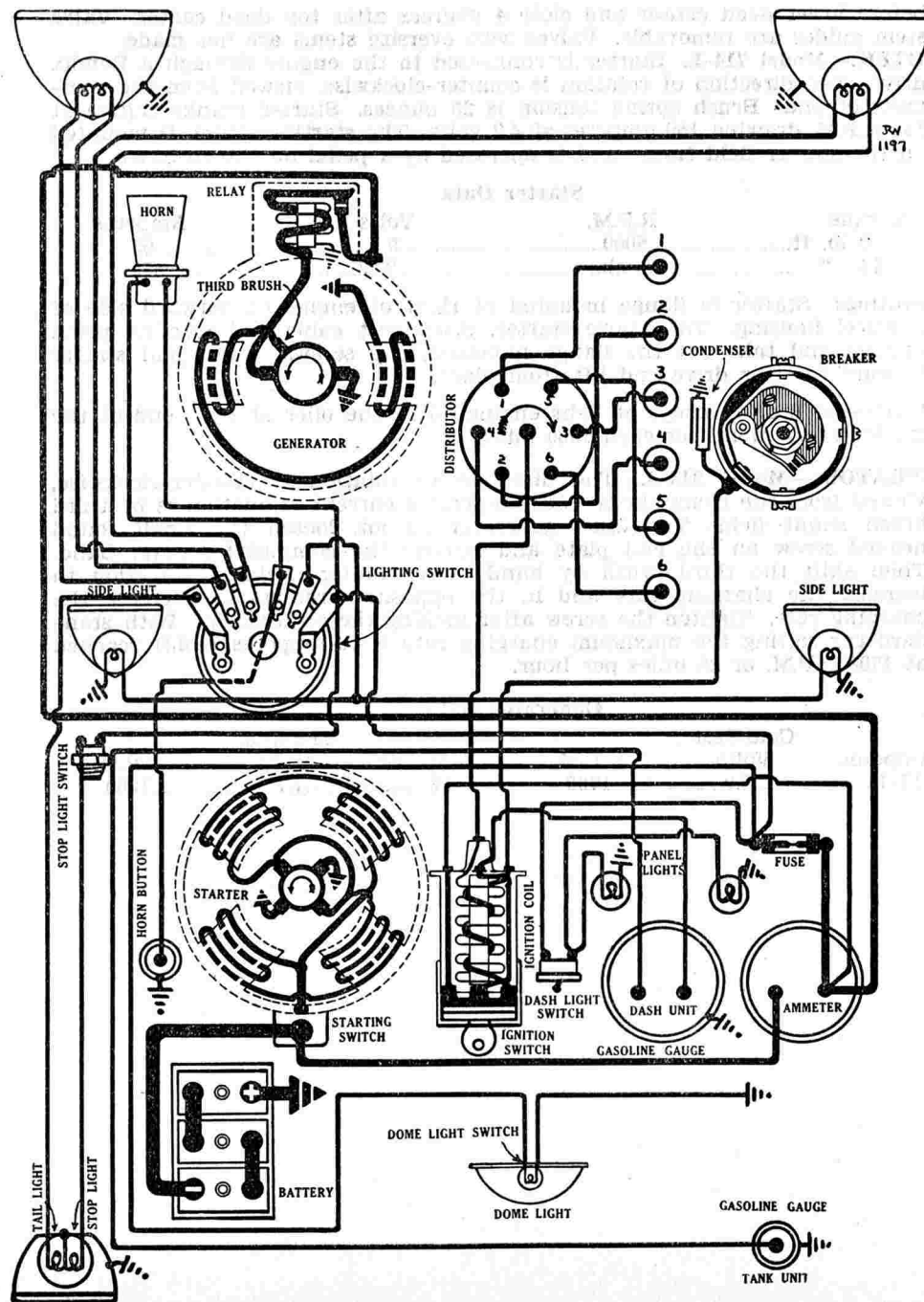
Distributor Model 632-K. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is full automatic. Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 13-15 degrees (engine) reached at 2000 R.P.M.

Mounting:—Distributor is mounted at the left of the engine and is driven by an inclined shaft from the camshaft. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then take out hold-down screw at rear of advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one full turn every month or each 1000 miles. At the same time remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position .034 inch (Standard 5.2-1 Compression Head) or .026 inch (6.2-1 Compression Red Head Engine) before top dead center. To set timing, first set breaker contact gap .020 inch. Then remove the $\frac{1}{8}$ inch pipe plug from the cylinder head directly above No. 6 cylinder and screw the special timing micrometer gauge in place in the hole. Connect a small six volt lamp in the primary circuit (this can be done by connecting one lamp lead to the primary terminal of the distributor and the other lamp lead to the relay terminal of the generator. If the battery is out of the car, connect the lamp lead to a battery and ground the other battery terminal to the engine). Turn engine over and set micrometer at zero on top dead center. Crank engine over until piston No. 1 is coming up on compression stroke (both valves will be closed) and stop when the gauge indicates that the piston is .034 inch (standard 5.2-1 Compression head) or .026 inch (6.2-1 Compression Red Head Engine) before top dead center. Remove distributor head and see that rotor is opposite No. 1 segment (see diagram). Loosen the advance arm clamp screw and rotate the distributor until the contacts begin to open, when the lamp will go out. Tighten the clamp screw and connect the spark plug leads in order 1-5-3-6-2-4 clockwise around the distributor head. Check the setting by cranking the engine over several times and then stopping with piston No. 1 on compression stroke at the point where the lamp goes out, indicating that the contacts have begun to open. If the gauge reading is within limits of .032-.036 inch (Std. 5.2 Head) or .024-.028 inch (6.2 Red Head) before top dead center, the setting is satisfactory. If outside these limits the engine should be retimed.

NOTE:—If the new type timing gauge (with a visible spark gap built in the face of the gauge) is used it will not be necessary to use a test lamp.



CHRYSLER SIX

SERIES CM (1931) AFTER SERIAL NUMBER 6,520,501

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

One gauge lead should be clipped to the high tension terminal in the center of the distributor head and the other gauge lead should be grounded to the engine. The ignition should be turned on. A spark will be visible at the spark gap at the instant the contacts open.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-12 (Std. 5.2 Engines) or G-80 (6.2 Red Head Engines). Gaps are .027-.030 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 17/32 inches. Stem diameter, .340-.341 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 42 pounds (valve closed), 78 pounds (valve open). Tappet clearance, .005 inch (hot). Inlet valves open 6 degrees after top dead center and close 46 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 15/32 inches. Stem diameter, .340-.341 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 42 pounds (valve closed) 78 pounds (valve open). Tappet clearance, .007 inch (hot). Exhaust valves open 42 degrees before lower dead center and close 8 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 725-Q.** Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
16 "	Lock	3	600

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out two flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every 1000 miles of operation.

GENERATOR:—**Model 943-R.** The direction of rotation is counter-clockwise,

viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	760	0	6.4	850
6	7.0	1000	6	7.0	1200
10	7.4	1200	10	7.4	1600
16	8.0	2300	12.5	7.7	2400
12	7.7	3200	10	7.5	3200

Shunt field current is 3.5-4.5 amperes at 6 volts. Generator, motoring, draws 3 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted at left of engine on special swinging bracket and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then remove two bolts holding generator on bracket and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 1000 miles of operation.

RELAY:—**Model 265-G.** Relay is mounted on the generator. Relay contacts close when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9150.** Lighting switch is mounted at lower end of steering column. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights (when used) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament. Dome light is 6-8 volt, 15 cp. S.C. Mazda 87.

FUSES:—Lighting fuse mounted on back of ammeter is 20 ampere capacity.

CHRYSLER

EIGHT SERIES CD, PRODUCTION STARTED JULY, 1930

NEW SERIES CDX (1931)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-2-15. 6 volt, 100 amperes hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 114 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted under the front floor boards on the left frame member.

IGNITION:—Coil Model 526-T. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

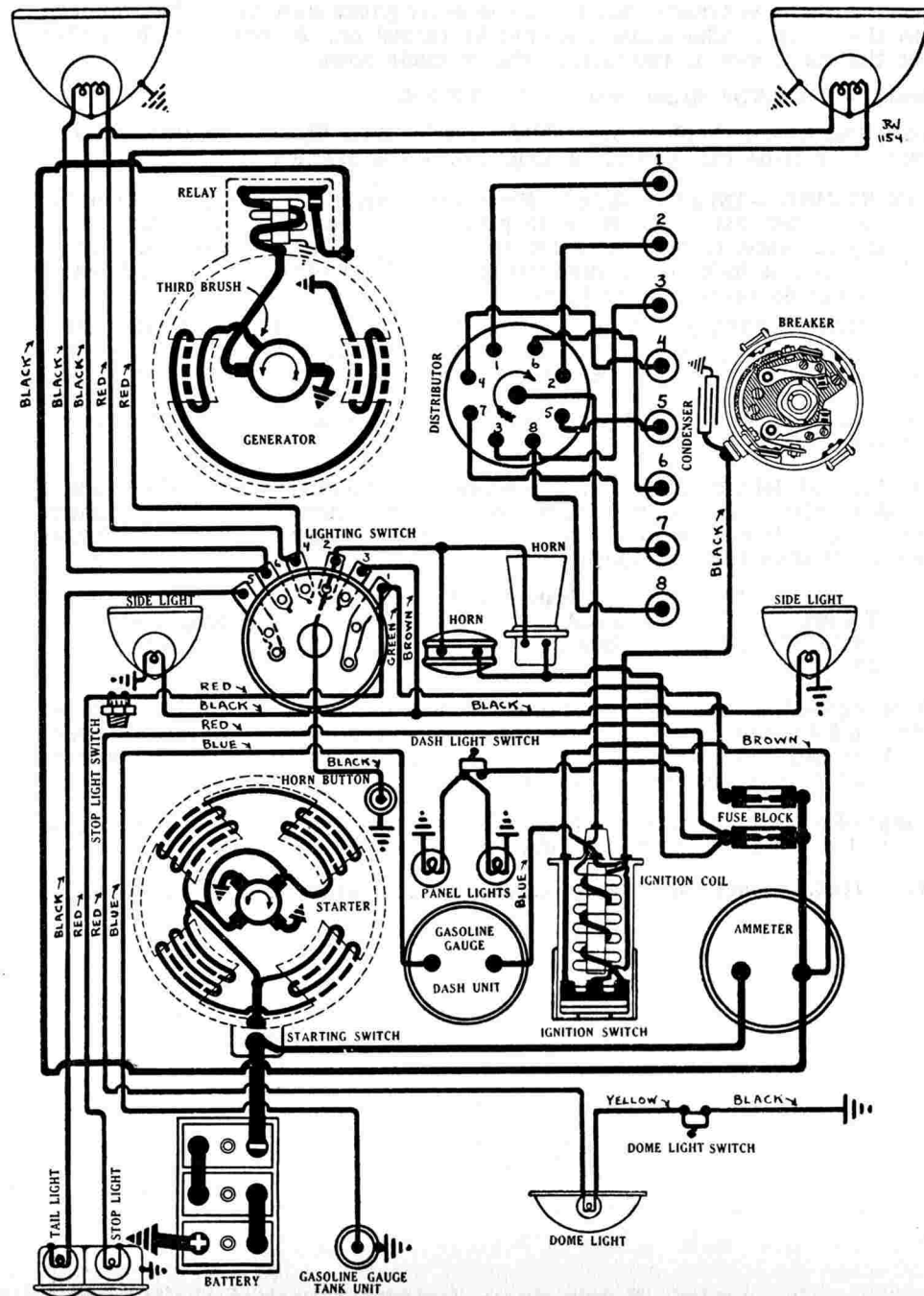
Distributor Model 660-G. Breaker contacts separate .018-.024 inch. Set contact gaps by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until gap is .020 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is full automatic. Maximum automatic advance is 18 degrees reached at 3000 R.P.M. of the engine. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the left of the engine and is driven by an inclined shaft from the camshaft. The oil pump is located on the opposite end of the inclined shaft. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then take out hold-down screw in advance plate and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down one full turn every 1000 miles of operation. At the same time remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section to synchronize contacts. The contacts can be synchronized using the regular timing gauge if an adapter is available so that the gauge can be mounted in the spark plug port of cylinder No. 6. The gauge should be set at zero on top dead center and the piston turned to firing position exactly as for timing (see next paragraph) and the lock screws on the movable sub-plate should then be loosened and the eccentric adjusting screw turned until the second set of contacts (mounted on the sub-plate) begin to open. Tighten the lock screws and check the contact gap. It must be within limits of .018-.024 inch.

Timing Distributor to Engine. On the first CD series cars, breaker contacts begin to separate when the piston entering power stroke reaches a position .060 inch (actual piston travel) before top dead center on cars with standard 5.2-1 compression cylinder head and .018 inch before top dead center with the optional 5.4-1 compression head or .010 inch before top dead center on Red Head Engines with 6.4 to 1 compression ratio. On the second CDX series, contacts open with piston .040 inch before top dead center (Standard 5.4 Head), .048 inch (5.3 A.S. Standard Head), or .040 inch (6.3 A.S. Red Head Engines) To set timing, remove the 1/8 inch pipe plug in the cylinder head directly over piston No. 8 and screw the special mi-



CHRYSLER

EIGHT SERIES CD, PRODUCTION STARTED JULY, 1930 NEW SERIES CDX (1931) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

chrometer timing gauge in the opening. Set breaker contact gap at .020 inch. Connect a six volt test lamp in series with the primary circuit by connecting one test lamp lead to the primary terminal on the distributor and the other lead to the relay terminal on the generator. If the battery is out of the car, connect this lead to one terminal of a six volt battery and ground the other battery lead to the engine block. The test lamp will remain lighted while the contacts are closed and will go out as the contacts open. Crank engine over and set micrometer gauge at zero with piston No. 8 on top dead center. Then turn engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed) and stop when the gauge indicates .060 inch (5.2-1 compression ratio), .018 inch (5.4-1 compression ratio) or .010 inch (6.4 Red Heads) on the CD series. On the CDX Series, gauge readings should be .040 inch (5.4 Standard Head), .048 inch (5.3 A.S. Standard Head) or .040 inch (6.3 A.S. Red Head) before top dead center. Loosen advance arm clamp screw and rotate distributor until lamp goes out, indicating that the first set of contacts (mounted directly on breaker plate) have begun to open. Tighten the clamp screw and check rotor to see that it is directly opposite No. 1 segment in the distributor head (see diagram). Check timing by cranking engine over several times and then stopping with No. 1 piston on compression stroke at the exact point at which the lamp goes out. The gauge reading should then be within limits of .055-.065 inch (standard 5.2 engines) or .016-.020 inch (5.4 engines) or .008-.012 inch (Red Head engines) on the CD series. On the later CDX series, the timing limits are .037-.043 inch (5.4 standard engine), .045-.051 inch (5.3 A.S. standard) or .037-.043 inch (6.3 A.S. Red Head engine). If the contacts have been correctly synchronized the second set of contacts (mounted on the movable sub-plate) will begin to open 45 degrees after this point when piston No. 6 reaches firing position.

NOTE:—If the latest type timing gauge (with a spark gap built in the gauge) is used it will not be necessary to employ a test lamp. The ignition should be turned on and one gauge lead connected to the coil high tension lead (remove the cable from the center terminal of the distributor and clip the gauge lead to it) and the other gauge lead should be grounded to the engine. A spark will be visible in the gauge spark gap at the instant the contacts open.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. A.C. Type G-10. Gaps are .020-.025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 13/32 inches. Stem diameter, 11/32 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 40-44 pounds (valve closed), 75-81 pounds (valve open). Tappet clearance, .005 inch (hot). Inlet valves open 4 degrees before top dead center and close 36 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 13/32 inches. Stem diameter, 11/32 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 40-44 pounds (valve closed), 75-81 pounds (valve open). Tappet clearance, .007 inch (hot). Exhaust valves open 52 degrees before lower dead center and close 2 degrees before top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 728-K.** Starter is connected to the engine through a set of reduction gears and a manual pinion shift interconnected with the starting switch. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5.6	75
.6 "	1550	5.5	100
5 "	780	5.0	200
10 "	460	4.5	300
15.4 "	270	4.0	400
28 "	Lock	3.0	600

Mounting:—Starter is flange mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at the commutator end of the armature shaft every 1000 miles of operation. Every six months remove the grease plug in the reduction gear compartment and repack the reduction gears with medium grease.

GENERATOR:—**Model 943-R.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush field. To adjust generator output, remove the commutator cover band and loosen the small round headed lock screw on the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting, the maximum charging rate is 18 amperes (cold) reached at 1750 R.P.M. or 20 M.P.H.

Cold Test			Generator Data			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	520	0	6.4	600	0	6.4	600
6	7.0	720	4	6.8	760	4	6.8	760
10	7.4	820	8	7.7	1000	8	7.7	1000
14	7.8	1020	14	7.8	2100	14	7.8	2100
18	8.3	1800	10	7.4	3200	10	7.4	3200
11.4	7.6	3200						

Shunt field current is 4-6.1 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted at left of engine on special swinging bracket and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Then swing generator toward engine and slip off drive belt. Then take out the two bolts under the generator forming the bracket hinge and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 1000 miles of operation.

RELAY:—**Model 265-G.** Relay is mounted on the generator field frame. Relay closes when the voltage of the generator reaches 7-7.5 volts and opens with a discharge current of 0-2.5 amperes. Charging current is approximately 2 amperes at closing of contacts. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9150.** Lighting switch is mounted at lower end of the steering column and is controlled by a lever on the steering wheel. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome light is 6-8 volt, 15 cp. S.C. Mazda 87. Corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Two lighting fuses are mounted on the back of the ammeter. They are each 20 ampere capacity.

CHRYSLER

IMPERIAL EIGHT MODEL CG (1931)

PRODUCTION STARTED JULY, 1930

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

BATTERY:—Willard, Type SJWR-6, 6 volt, 153 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 160 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 30 hours. Battery is mounted under the front floor boards on the left frame member.

IGNITION:—Coil Model 526-T. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

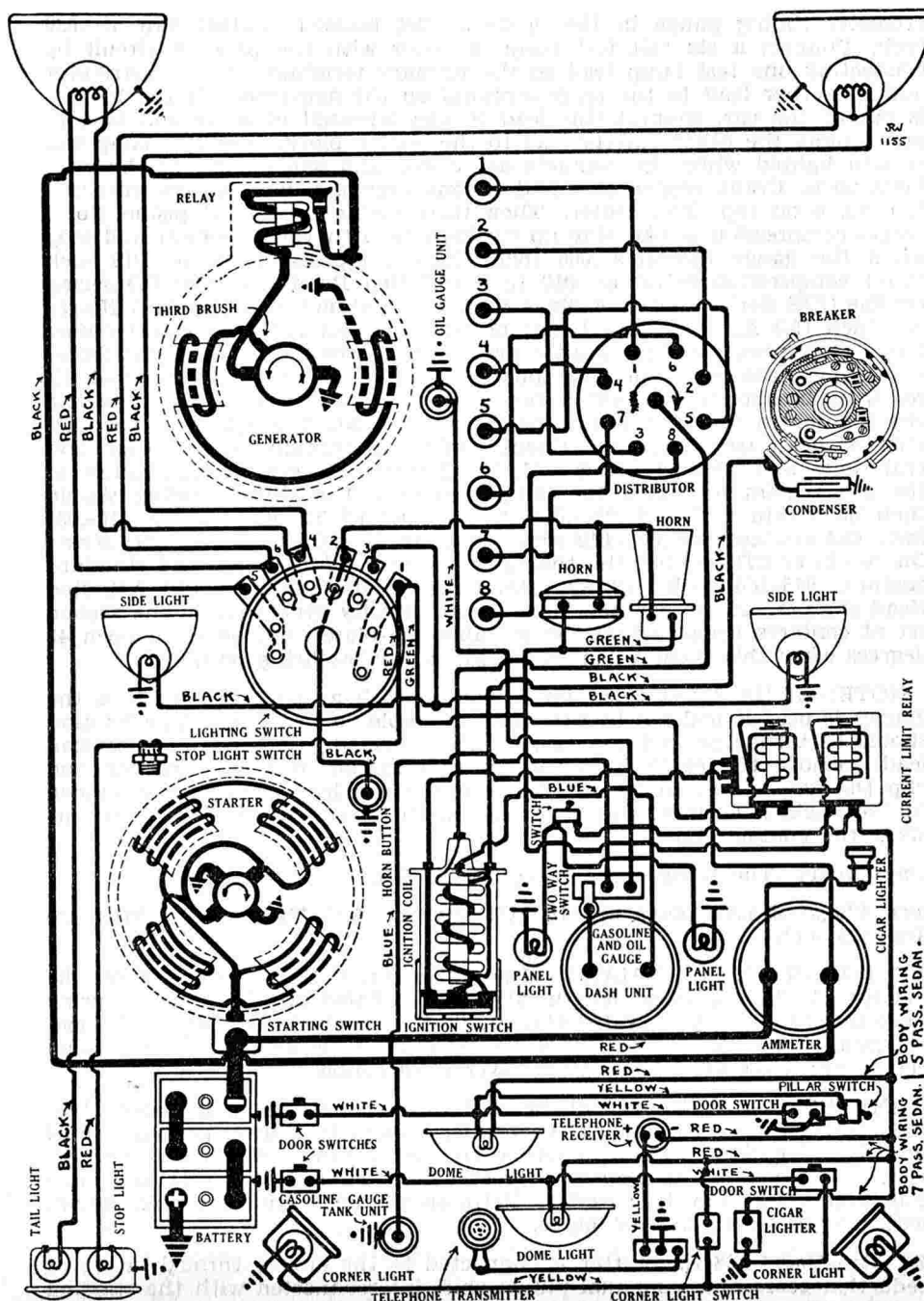
Distributor Model 660-F. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate (directly behind breaker arm) and turning eccentric adjusting screw until gap is .020 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 22 degrees (engine). Maximum automatic advance is 20 degrees reached at 2800 R.P.M. of the engine. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the right side of the cylinder head and is driven by a vertical shaft from the camshaft. The oil pump is mounted on the lower end of the shaft. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one full turn every 1000 miles of operation. At the same time remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section to synchronize contacts. The contacts can be synchronized using the regular timing gauge if an adapter is available to permit the gauge to be mounted in the spark plug port of cylinder No. 6. The gauge should be set at zero on top dead center and the piston turned to firing position exactly as for timing (see next paragraph). Then loosen the lock screws on the movable sub-plate and turn the eccentric adjusting screw until the second set of contacts (mounted on the sub-plate) begin to open. Tighten the lock screws and check the contact gap. It must be within limits of .018-.024 inch.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering the power stroke reaches a position .047 inch (actual piston travel) before top dead center with the manual spark control in the fully advanced position. To set timing, remove the $\frac{1}{8}$ inch pipe plug in the cylinder head directly over No. 8 piston and screw the special micrometer timing gauge in place in the opening. Set breaker gap at .020 inch and fully advance manual spark control. Connect a six volt test lamp in series with the primary circuit by connecting one lamp lead to the primary terminal on the distributor and the other lamp lead to the relay terminal



CHRYSLER

IMPERIAL EIGHT MODEL CG (1931)

PRODUCTION STARTED JULY, 1930

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

on the generator. If the battery is out of the car, connect this lead to one terminal of a six volt battery and ground the other battery terminal to the engine block. The lamp will remain lighted while the contacts are closed and will go out as the contacts open. Crank engine over and set micrometer gauge at zero with piston No. 8 on top dead center. Then turn engine over until piston No. 1 enters compression stroke and stop when the gauge indicates .047 inch before top dead center. Loosen advance arm clamp screw and rotate distributor until the lamp goes out indicating that the first set of contacts (mounted directly on the breaker plate) have begun to open. Tighten the clamp screw and check position of rotor to see that it is directly opposite No. 1 segment in the distributor head (see diagram). Check timing by cranking engine over several times and then stopping with No. 1 piston on compression stroke at the exact instant the lamp goes out. The gauge reading should be .047 inch. If the contacts are correctly synchronized the second set of contacts (mounted on the movable sub-plate) will begin to open exactly 45 degrees after this point when piston No. 6 reaches firing position.

NOTE:—If the latest type timing gauge is used (which has a spark gap built in the face of the gauge), it will not be necessary to employ the test lamp. The ignition should be turned on and one lead from the gauge spark gap should be clipped to the coil high tension cable at the terminal in the center of the distributor head. The other gauge lead should be grounded to the engine. A spark will be visible in the gauge spark gap at the instant the contacts open.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-12. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 23/32 inches. Stem diameter, 11/32 inch. Stem length, 6 9/16 inches. Valve lift, .3125 inch. Spring pressure, 50-55 pounds (valve closed), 80-85 pounds (valve open). Tappet clearance, .005 inch (hot). Inlet valves open 6 degrees after top dead center and close 46 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 21/32 inches. Stem diameter, 11/32 inch. Stem length, 6 9/16 inches. Valve lift, .3125 inch. Spring pressure, 50-55 pounds (valve closed), 80-85 pounds (valve open). Tappet clearance, .007 inch (hot). Exhaust valves open 42 degrees before lower dead center and close 8 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 728-N.** Starter is connected to the engine through a set of reduction gears and a manual pinion shift interconnected with the starting switch. The direction of rotation (armature shaft) is clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	Free	5.7	65
1 "	1520	5.5	100
4 "	760	5.0	200
10 "	460	4.5	300
15.5 "	260	4.0	400
19.5 "	120	3.5	500
28 "	Lock	3.0	600

Mounting:—Starter is sleeve mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out large pilot screw in flywheel housing directly above starter sleeve. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the armature shaft every 1000 miles of operation. Every six months remove the grease plug in the reduction gear case and repack the gears with medium grease.

GENERATOR:—**Model 957-U.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and loosen the small round headed lock screw on the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 16 amperes (cold) reached at 1700 R.P.M. or 20 M.P.H.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
16	8.5	1700	12	7.5	1800

Shunt field current is 4-6.1 amperes at 6 volts. Generator draws 5.5 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted on special swinging bracket at the left of the engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then take out two bolts under generator which form bracket hinge and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 1000 miles of operation.

RELAY:—**Model 265-B.** Relay contacts close at 600 R.P.M. when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9150.** Lighting switch is mounted at the lower end of the steering column and is controlled by a lever on the steering wheel. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop lights are 6-8 volt, 15 cp. S.C. Mazda 87. Dash, tail and corner lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome light is 6-8 volt, 15 cp S.C. Mazda 87.

CURRENT LIMIT RELAY:—**Model 410-E.** This device consists of two vibrating circuit breakers mounted on the dash and connected in the lighting circuits. Circuit breakers begin to operate when the current reaches 25-30 amperes and continue limiting the current to 2-15 amperes. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed.

CORD

FRONT WHEEL DRIVE MODEL L-29 (1931) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

The Cord is a Front Wheel Drive Automobile. The engine, while essentially a stock engine, is reversed in the chassis with the flywheel and transmission at the forward end. The timing chain is likewise at the forward end between the engine block and the flywheel. The crankshaft revolves counter-clockwise. The starter drives to the flywheel and is mounted on the rear of the flywheel case which is thus the forward end of the engine. The battery is mounted near the starter on a bracket above the transmission case under the engine hood. The electrical units are similar to those used on ordinary rear wheel drive cars and no trouble should be experienced in service work.

BATTERY:—U.S.L. Type XY-15X-6A, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 119 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 21 hours. Battery is mounted on special bracket directly above transmission case under the engine hood at the forward end of the engine.

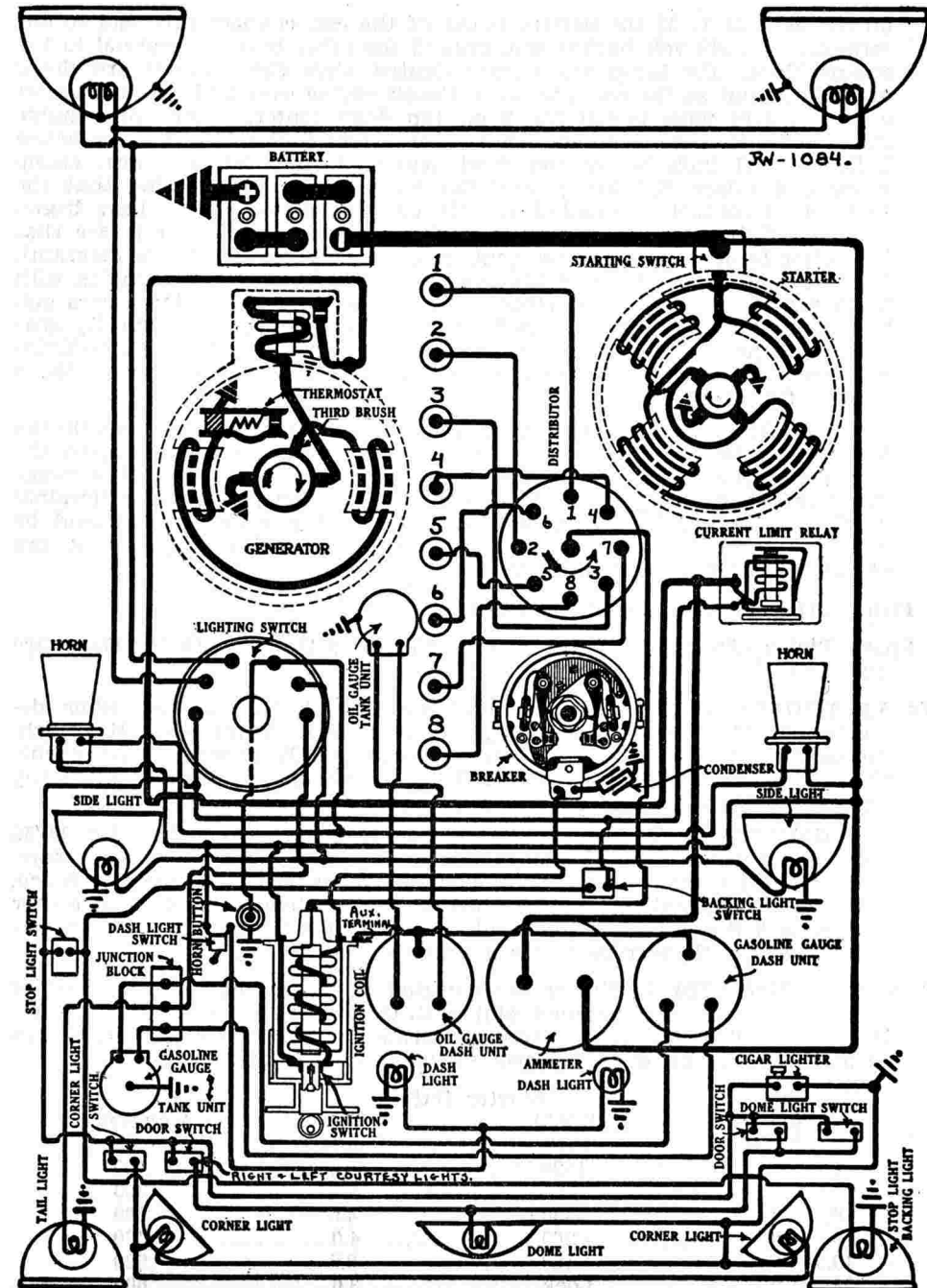
IGNITION:—Coil Model 526-V. Coil is mounted on the back of the instrument board with the ignition switch (which is built in the base of the coil) extending through to the face of the instrument panel. An extra terminal is located on the end of the coil from which the feed for the gasoline and oil gauge is taken. Ignition current is .6-3.0 amperes at 6 volts with engine running and 5 amperes at 6 volts with engine stopped.

Distributor Model 658-W. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine). Automatic advance begins at 800 R.P.M. of engine. Maximum automatic advance is 13-17 degrees reached at 3600 R.P.M. Distributor has two sets of contacts on a four sided cam. Contacts separate alternately at intervals of 45 degrees corresponding to the firing interval of 90 degrees on the engine crankshaft. Contacts must be synchronized for correct ignition performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual control rod and primary lead and take off distributor head with cables intact. Then remove hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one half turn every month or each 1000 miles of operation. At the same time remove the distributor head and rotor and oil the wick oiler in the center of the shaft and place a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 820738, and follow complete directions in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over exactly 90 degrees when piston No. 6 will reach firing position (top dead center entering power stroke). If the second set of contacts do not open at this point, loosen the two lock screws on the movable sub-plate and turn the eccentric adjusting screw until contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.



CORD

FRONT WHEEL DRIVE MODEL L-29 (1931) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

Timing Distributor to Engine:—Breaker contacts begin to separate when the piston entering power stroke reaches a position 3 teeth on the flywheel before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the engine is hand cranked in the usual way through an opening in the differential case at the front of the engine. The hand crank engages the crankshaft through an idler shaft and spur gear so that the crank should be turned clockwise in the usual way). Fully advance spark control lever. Continue to crank engine over until a point on the flywheel 3 teeth before the top dead center mark '1-8DC' is directly opposite the indicator in the inspection hole in the flywheel case. The crankshaft rotates in the opposite direction from an ordinary engine which reverses the position of the mark on the flywheel. Then loosen advance arm clamp screw and rotate distributor until one set of contacts begin to open. Tighten the clamp screw and make certain that the segment opposite the rotor is connected to the plug in cylinder No. 1.

The proper ignition setting is determined by setting breaker contacts to open at top dead center with the manual spark control fully advanced and then rotating distributor clockwise to advance spark until a slight 'ping' or spark knock is noticed throughout the speed range of the car.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4. No. 1 cylinder nearest the radiator.

Spark Plugs:—Spark plugs are 18MM. Metric. Gaps are .030 inch.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1 $\frac{1}{8}$ inches. Stem diameter, .341-.3425 inch. Stem length, 4 $\frac{7}{8}$ inches. Valve lift, 11/32 inch. Tappet clearance, .006 (hot). Spring pressure, 45.5 pounds (valve closed). Inlet valves open 5 degrees before top dead center and close 40 degrees after lower dead center. The point of inlet opening is 1 $\frac{1}{2}$ teeth on the flywheel before the top dead center mark '1-8DC.' Degrees on the flywheel can be changed into number of teeth before or after dead center by dividing the number of degrees by 3.22.

EXHAUST VALVES:—Head diameter, 1 15/32 inches. Stem diameter, .341-.3425 inch. Stem length, 4 $\frac{7}{8}$ inches. Valve lift, 11/32 inch. Tappet clearance, .008 inch (hot). Spring pressure, 45.5 pounds (valve closed). Exhaust valves open 50 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are made.

STARTER:—Model 724-N. Starter is connected to the engine through reduction gears and a Bendix drive. The direction of rotation is clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces. Starting switch is Delco-Remy Part No. 821627.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3500	5	70
22 "	Lock	3	600

Mounting:—Starter is flange mounted at right of engine on rear of flywheel case. To remove starter, disconnect engine ventilator pipe and starter cable

and take out three flange mounting cap screws. Then pull starter to the rear to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the armature shaft every month or each 1000 miles of operation. Every six months remove the grease plug in the reduction gear case and repack gears with graphite grease.

GENERATOR:—Model 957-J. The direction of rotation is clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165° cutting the resistance across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, loosen the small round headed screw on the end plate and remove the commutator cover band. Then shift the third brush in a clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 19-21 amperes at 8.5 volts reached at 1450 R.P.M.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
7	7-7.3	750	11-14	7.35-7.65	1900-2100
19-21	8.3-8.5	1800			

Shunt field current is 4-5.2 amperes at 6 volts. Brush spring tension is 14-18 ounces. Generator motoring draws 5.5 amperes at 6 volts.

Mounting:—Generator is base mounted at left of engine and is driven by accessory shaft from the chain case. To remove generator, disconnect lead and two screws in flexible drive coupling. Then take out four screws in base and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in each of the generator bearing oilers every month or each 1000 miles of operation.

RELAY:—Model 265-J. Relay is mounted on the generator. Relay contacts close at 575 R.P.M. when the generator voltage reaches 6.8-7.3 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Soreng Manegold Switch Model 5650-A. Switch is mounted at the base of the steering column. Double filament headlights using a second 21 cp. filament instead of dimmers are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing light is 6-8 volt, 15 cp. S.C. Mazda 87. Tail light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash and dome lights are 6-8 volt, 3 cp. S.C. Mazda 63. Corner lights are 6-8 volt, 6 cp. S.C. Mazda 81.

CURRENT LIMIT RELAY:—Model 410-C. This device is a vibrating circuit breaker mounted on the dash and connected in the lighting circuits to protect them from overload and short-circuits. It begins to vibrate when the current reaches 25-30 amperes and continues limiting the current to 2-15 amperes. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed.

CUNNINGHAM

SERIES V-9 (1930-31) DELCO-REMY GENERATING, STARTING SYSTEM NORTH EAST IGNITION

BATTERY:—Willard, Type SJRR-5, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 145 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 27 hours. Battery is mounted on the right frame member under the front compartment floor boards.

IGNITION:—Coil Type 5023660. The ignition switch is built in the base of the coil. The coil is mounted on the back of the dash with the ignition switch extending through to the face of the instrument panel. Ignition current is 2.75 amperes at 400 R.P.M., dropping off to .8 amperes at 4000 R.P.M. Ignition current with engine stopped is 4.75 amperes at 6 volts.

Distributor Type 10874. Breaker contacts separate .020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up the stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16 ounces. Distributor is semi-automatic. Maximum manual advance is 40 degrees (engine). Automatic advance begins at 600 R.P.M. of the engine. Maximum automatic advance is 16 degrees reached at 3000 R.P.M. Breaker has two sets of contacts operating on an eight lobe cam. Contacts open simultaneously and the contact gap on both sets of contacts must be held closely to the specified gap to insure this simultaneous opening.

Mounting:—Distributor is mounted at the forward end of the engine between the cylinder banks. To remove the distributor, disconnect the manual spark control and primary lead and remove the distributor head with the cables intact. Then take out mounting screw and lift distributor from place.

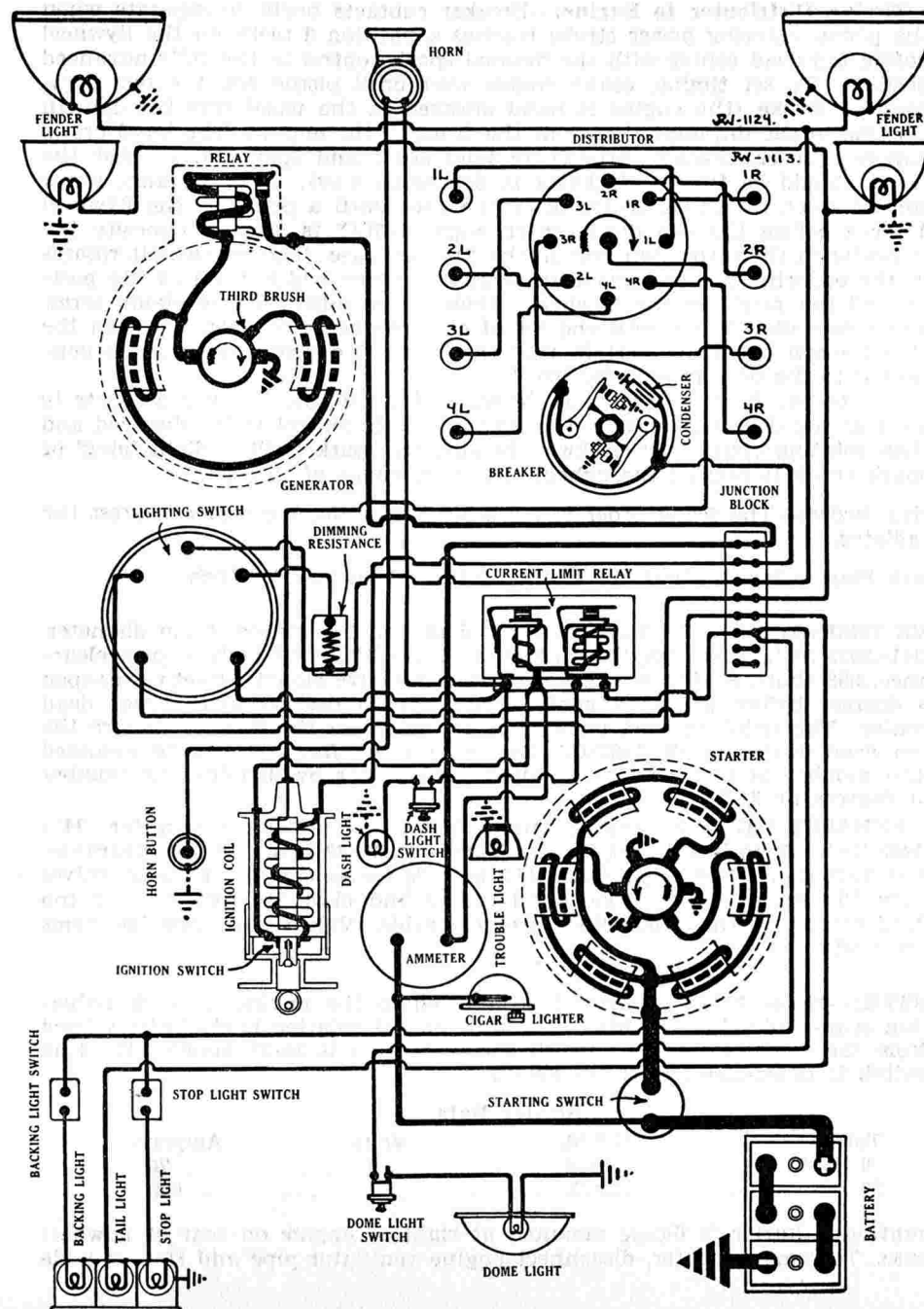
Oiling:—Fill the grease cup under the distributor head and turn down one turn every 1000 miles of operation. At the same time remove the distributor head and rotor and put a drop of oil on the breaker arm pivot pins and place a small bit of vaseline or grease on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position $1\frac{1}{2}$ inches after top dead center (measured on the flywheel) with the manual spark control fully retarded. To set timing, crank engine over until piston No. 1 of the right hand bank enters compression stroke (the up stroke with both valves closed). Fully retard the manual spark control and remove the timing inspection cover plate in the flywheel housing. Turn engine over until a point on the flywheel $1\frac{1}{2}$ inches past the top dead center mark '#1 UP' is opposite the indicator on the flywheel housing. Then loosen the advance arm clamp screw and rotate the distributor until both sets of contacts begin to open. Tighten the clamp screw and see that the segment in the distributor head opposite the rotor is connected to the spark plug in cylinder No. 1.

Synchronization of Contacts. Contacts should be synchronized whenever ignition timing is checked or contact adjustment changed. Use test lamps connected across each set of contacts to accurately determine when contacts open. The breaker plate is constructed with .020 inch clearance inside the housing and the entire plate can be shifted after the two hold-down screws have been loosened. To synchronize contacts, loosen the hold-down screws and shift the plate until both contacts open at the same instant. Tighten the hold-down screws after making the adjustment.

Firing Order:—The firing order is 1R-1L-4R-4L-2L-3R-3L-2R. The cylinder banks are right (R) and left (L) as viewed from the driver's seat. No. 1 cylinder is nearest the radiator.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Short Body. Gaps are .031 inch.



CUNNINGHAM

SERIES V-9 (1930-31)

**DELCO-REMY GENERATING, STARTING SYSTEM
NORTH EAST IGNITION**

VALVE TIMING:—INLET VALVES. Head diameter, 1 $\frac{7}{8}$ inches. Stem diameter, .432 inch. Stem length, 6 $\frac{1}{8}$ inches. Valve lift, $\frac{3}{8}$ inch. Spring pressure, 75 pounds. Tappet clearance, .0015 inch (cold). Inlet valves open 5 degrees after top dead center and close 51 degrees after lower dead center. The flywheel is marked at the point of inlet opening and exhaust closing for cylinders No. 1 (1R) and No. 5 (1L).

EXHAUST VALVES. Head diameter, 1 $\frac{7}{8}$ inches. Stem diameter, .432 inch. Stem length, 6 $\frac{1}{8}$ inches. Valve lift, $\frac{3}{8}$ inch. Spring pressure, 75 pounds. Tappet clearance, .003 inch (cold). Exhaust valves open 41 degrees before lower dead center and close 5 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not furnished.

STARTER:—Model 350. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter brush spring tension is 36-40 ounces. Starter switch is Model 406-G.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4000	4	60
19 "	Lock	3	500

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and take out three flange mounting cap screws. Then pull starter forward to clear Bendix and lift from place.

Oiling:—Starter bearings are oilless. They require no attention.

GENERATOR:—Model 285. The direction of rotation is clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust the generator output, remove the commutator cover band and shift the third brush by hand. There is a handle on the brush mounting plate for this purpose. Shift the third brush in a clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. With standard car setting the maximum charging rate is 18-20 amperes reached at 1600 R.P.M. or 25 miles per hour.

Generator Data

Amperes	Volts	R.P.M.
3	.....	600
9	.....	800
18-20	7.5	1600

Shunt field current is 3 amperes at 6 volts. Brush spring tension is 24-28 ounces. Generator, motoring, draws 6 amperes at 6 volts.

Mounting:—Generator is cradle mounted at the front of the engine and is accessible from the left side. To remove generator, disconnect the lead and loosen the mounting clamp band by taking off the lock nut and holding nut on the band. Then slide the generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator field frame. Relay contacts close when the voltage of the generator reaches 6.75-7.5 volts and open with a discharge current of 0-3 amperes. Relay contact gap should be .015-.025 inch. Air gap should be .014-.020 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 486-D. Lighting switch is mounted at the lower end of the steering column. Headlights are dimmed by a resistance coil mounted on the dash. Headlights are 6-8 volt, 21 cp. S.C. Mazda 1129. Stop and backing lights are 6-8 volt, 21 cp. S.C. Mazda 1129. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome and corner lights are 6-8 volt, 3 cp. D.C. Mazda 64.

CIRCUIT BREAKER:—Delco-Remy Model 5759. (Used on some cars.) This unit consists of a vibrating circuit breaker and a lock-out circuit breaker mounted on the dash. The vibrating circuit breaker (connected in the lighting circuits) begins to operate when the current reaches 25-30 amperes and continues limiting the current to 5-15 amperes. The lock-out circuit breaker (connected in the dash light and dome light circuits) begins to operate when the current reaches 25-30 amperes limiting the current to less than 1 ampere.

FUSES:—A 10 ampere fuse is mounted on the cigar lighter.

DE SOTO

SIX MODEL CK (1930-31)

DELCO-REMY GENERATING STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-1-13, 6 volt, 86 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 16.8 hours. Battery is mounted under the front floor boards on the left frame member.

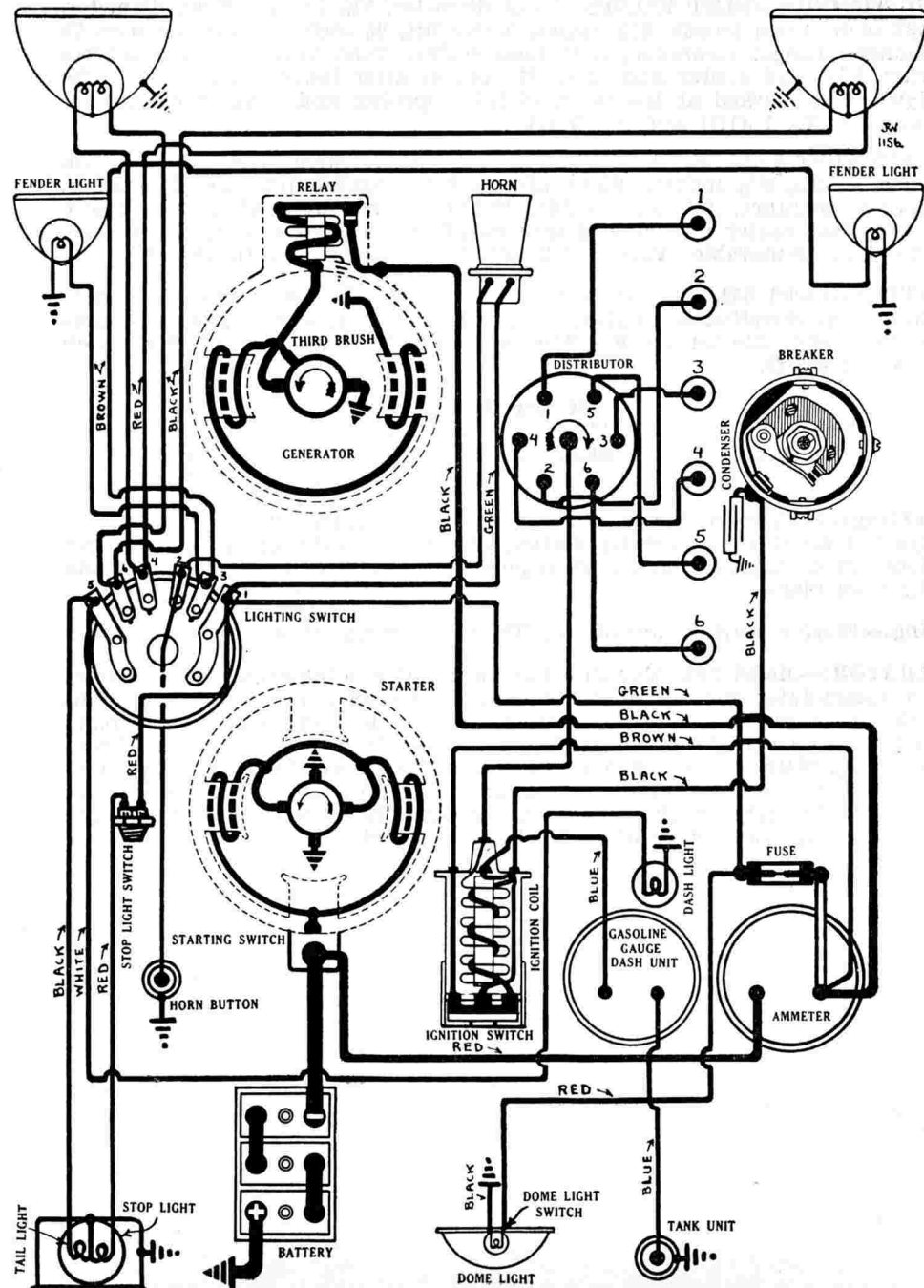
IGNITION:—Coil Model 526-K. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

Distributor Model 632-D. Breaker contacts separate .020 inch. Set contact gap by loosening lock screw on crescent shaped stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 15 degrees reached at 2000 R.P.M. of engine. Manual advance is controlled by a button on the dash and the car is designed to operate with the button in the fully advanced position (pushed all the way in toward the dash). Pulling out the spark control button provides an auxiliary retard for starting.

Mounting:—Distributor is mounted at the left of the engine and is driven by an inclined shaft from the camshaft. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down one full turn every month or each 1000 miles of operation. At the same time remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position .028 inch (actual piston travel) before top dead center. To set timing, first set breaker contact gap at .020 inch and see that manual spark control is fully advanced. Then remove the 1/8 inch pipe plug in the cylinder head directly over No. 6 piston and screw the special micrometer timing gauge in place in the opening. Connect a small 6 volt test lamp in the primary circuit by connecting one test lamp lead to the primary terminal on the distributor and the other lead to the relay terminal on the generator. If the battery is out of the car, connect this lead to one terminal of a six volt battery and ground the other battery terminal to the car frame. The test lamp will remain lighted while the contacts are closed and will go out as the contacts open, affording a very accurate determination of the contact opening. Turn the engine over until piston No. 6 reaches top dead center and set the micrometer gauge at zero. Then turn engine over until piston No. 1 enters compression stroke and stop when the gauge indicates .028 inch before top dead center. Then loosen the advance arm clamp screw and rotate the distributor until the lamp goes out, indicating that the contacts have begun to open. Tighten the clamp screw and see that the rotor is directly opposite No. 1 segment in the distributor head (see diagram). Check the ignition setting by cranking the engine over several times and stopping with No. 1 piston on compression stroke at the exact point at which the lamp goes out. The gauge reading should be



DE SOTO

SIX MODEL CK (1930-31)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

within limits of .026-.030 inch before top dead center. If gauge reading is outside these limits the engine must be retimed.

Red Head Engines:—Timing directions as given above apply to standard 5.2-1 compression head engines. The 'Red Head' high compression (6.2-1) engines are timed in the same way except that contacts open .020 inch before top dead center and the timing limits are .018-.022 inch before top dead center.

NOTE:—The new type timing gauge has a visible spark gap built in the gauge. If this indicator is used one terminal lead on the gauge should be clipped to the high tension lead from the coil at the distributor and the other gauge terminal lead should be grounded to the engine. Turn on ignition and proceed with timing. No test lamp need be used.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. Gaps are .020-.025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 15/32 inches. Stem diameter, 11/32 inch. Stem length, 5 1/4 inches. Spring pressure, 40-44 pounds (valve closed), 75-81 pounds (valve open). Valve lift, .3125 inch. Tappet clearance, .005 inch (hot). Inlet valves open 6 degrees after top dead center and close 46 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 15/32 inches. Stem diameter, 11/32 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 40-44 pounds (valve closed), 75-81 pounds (valve open). Tappet clearance, .007 inch (hot). Exhaust valves open 42 degrees before lower dead center and close 8 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 714-Q.** Starter is connected to the engine through a mechanical pinion shift interconnected with the starting switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3800	5.6	80
.4 "	3250	5.5	100
3 "	1500	5.0	200
6 "	800	4.5	300
9.4 "	350	4.0	400
13 "	Lock	3.5	500

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out two flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles of operation. The drive

end bearing is oilless.

GENERATOR:—**Model 943-R.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and loosen the small round headed lock screw on the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 16 amperes (cold) reached at 2100 R.P.M.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	760	0	7.0	850
6	7.0	1000	6	7.0	1200
10	7.4	1200	10	7.4	1600
16	8.0	2100	12.5	7.7	2300
12	7.7	3200	10	7.5	3200

Shunt field current is 4-5.9 amperes at 6 volts. Generator, motoring, draws 3 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted on special hinge bracket at the left of the engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then take out two hinge bolts in bracket under generator and lift generator from place.

Belt Adjustment. The fan belt tension is adjusted by shifting the generator. To adjust belt, loosen the two hinge bolts and the adjustment clamp bolt and swing generator away from the engine until belt tension is just sufficient to drive fan and generator without slipping. Tighten the bolts.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles of operation.

RELAY:—**Model 265-G.** Relay is mounted on the generator. Relay closes at 750 R.P.M. when the generator voltage reaches 7-7.5 volts and opens with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9150.** Lighting switch is mounted at the lower end of the steering column and is controlled by a lever on the steering wheel. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights (on fenders) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail light is 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament. Dome light is 6-8 volt, 15 cp. S.C. Mazda 87.

FUSES:—Lighting fuse mounted on back of ammeter is 20 ampere capacity.

DE SOTO

SERIES SA (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-1-13. 6 volt, 84 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 16.8 hours. Battery is mounted on the left frame member.

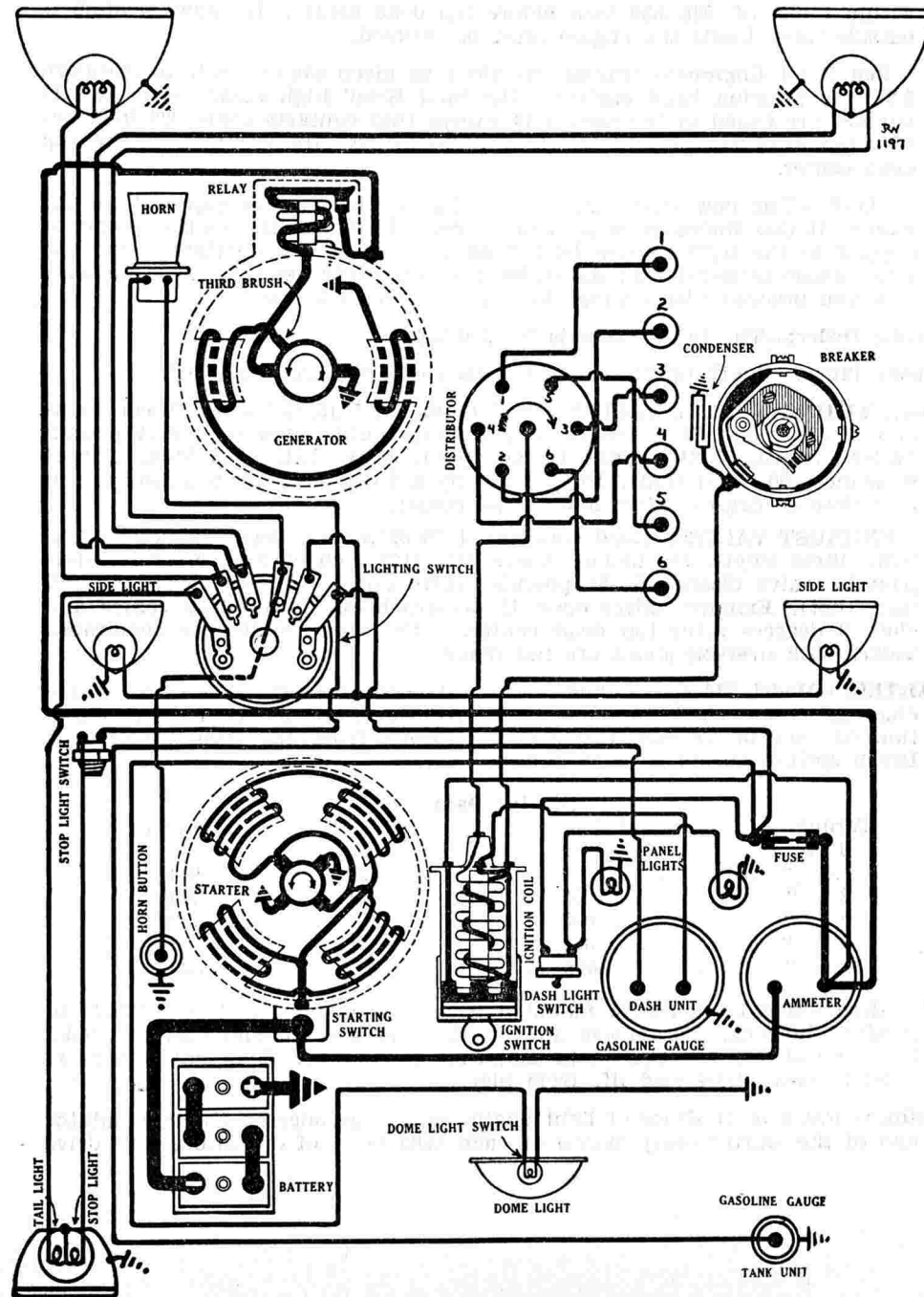
IGNITION:—Coil Model 526-T. The ignition switch is built in the base of the coil. Coil is mounted on the rear of the dash with the ignition switch extending through to the face of the instrument panel. Ignition current is 1.5 amperes at 6 volts with engine running and 5 amperes at 6 volts with engine stopped.

Distributor Model 632-L. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is full automatic. Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 13-15 degrees (engine) reached at 2000 R.P.M.

Mounting:—Distributor is mounted at the left of the engine and is driven by an inclined shaft from the camshaft. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then take out hold-down screw at rear of advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one full turn every month or each 1000 miles. At the same time remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position .055 inch (Standard 5.2-1 Compression Head) or .031 inch (6.2-1 Compression Red Head Engine) before top dead center. To set timing, first set breaker contact gap at .020 inch. Then remove the 1/8 inch pipe plug from the cylinder head directly above No. 6 cylinder and screw the special timing micrometer gauge in place in the hole. Connect a small six volt lamp in the primary circuit (this can be done by connecting one lamp lead to the primary terminal of the distributor and the other lamp lead to the relay terminal of the generator. If the battery is out of the car, connect the lamp lead to a battery and ground the other battery terminal to the engine). Turn engine over and set micrometer at zero on top dead center. Crank the engine over until piston No. 1 is coming up on compression stroke (both valves will be closed) and stop when the gauge indicates that the piston is .055 inch (Standard 5.2-1 Compression Head) or .031 inch (6.2-1 Compression Red Head Engine) before top dead center. Remove distributor head and see that rotor is opposite No. 1 segment (see diagram). Loosen the advance arm clamp screw and rotate the distributor until the contacts begin to open, when the lamp will go out. Tighten the clamp screw and connect the spark plug leads in order 1-5-3-6-2-4 clockwise around the distributor head. Check the setting by cranking the engine over several times and then stopping with piston No. 1 on compression stroke at the point where the lamp goes out, indicating that the contacts have begun to open. If the gauge reading is within limits of .050-.060 inch (Std. 5.2 Head) or .029-.033 inch (6.2 Red Head) before top dead center, the setting is satisfactory. If outside these limits the engine should be retimed.



DE SOTO

SERIES SA (1931)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

NOTE:—If the new type gauge (with a spark gap built in the face of the gauge) is used it will not be necessary to use a test lamp. Connect one gauge lead to the high tension terminal in the center of the distributor head and ground the other gauge lead to the engine. The ignition should be turned on. A spark will be visible at the spark gap at the instant the contacts open.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. A.C. Type G-11. Gaps are .027-.030 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 17/32 inches. Stem diameter, .340-.341 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 42 pounds (valve closed), 78 pounds (valve open). Tappet clearance, .005 inch (hot). Inlet valves open 6 degrees after top dead center and close 46 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 15/32 inches. Stem diameter, .340-.341 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 42 pounds, (valve closed), and 78 pounds (valve open). Tappet clearance, .007 inch (hot). Exhaust valves open 42 degrees before lower dead center and close 8 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 725-Q.** Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
16 "	Lock	3	600

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles. The drive end bearing is oilless.

GENERATOR:—**Model 943-R.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the

generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	760	0	6.4	850
6	7.0	1000	6	7.0	1200
10	7.4	1200	10	7.4	1600
16	8.0	2100	12.5	7.7	2300
12	7.7	3200	10	7.5	3200

Motoring, generator draws 3 amperes at 6 volts. Shunt field current is 3.5-4.5 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted on special hinge bracket at left of engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then remove two bolts holding generator on bracket and lift generator from place.

Belt Adjustment. The fan belt tension is adjusted by swinging the generator away from the engine. To make the adjustment, loosen the two bolts under the generator. Then loosen adjustment clamp bolt and pull generator out from the engine until the proper belt tension is secured. Tighten the clamp bolt and the mounting bolts. The belt tension should be just sufficient to drive the fan and generator without slipping. Any excessive belt tension will cause wear in the generator bearings.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles of operation.

RELAY:—**Model 265-G.** Relay is mounted on the generator. Relay contacts close when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9150.** Lighting switch is mounted at lower end of steering column. Headlights are equipped with double filament bulbs using the second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament. Dome light is 6-8 volt, 15 cp. S.C. Mazda 87.

FUSES:—Lighting fuse mounted back of the ammeter is 20 ampere capacity.

DE SOTO EIGHT

MODEL CF (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WSB-15, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 105 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the left frame member.

IGNITION:—Coil Model 526-N. The ignition switch is built in the base of the coil. Coil is mounted on the back of the dash with the ignition switch extending through to the face of the instrument panel. Ignition current is 1.5-2 amperes at 6 volts with engine running and 5 amperes at 6 volts with engine stopped.

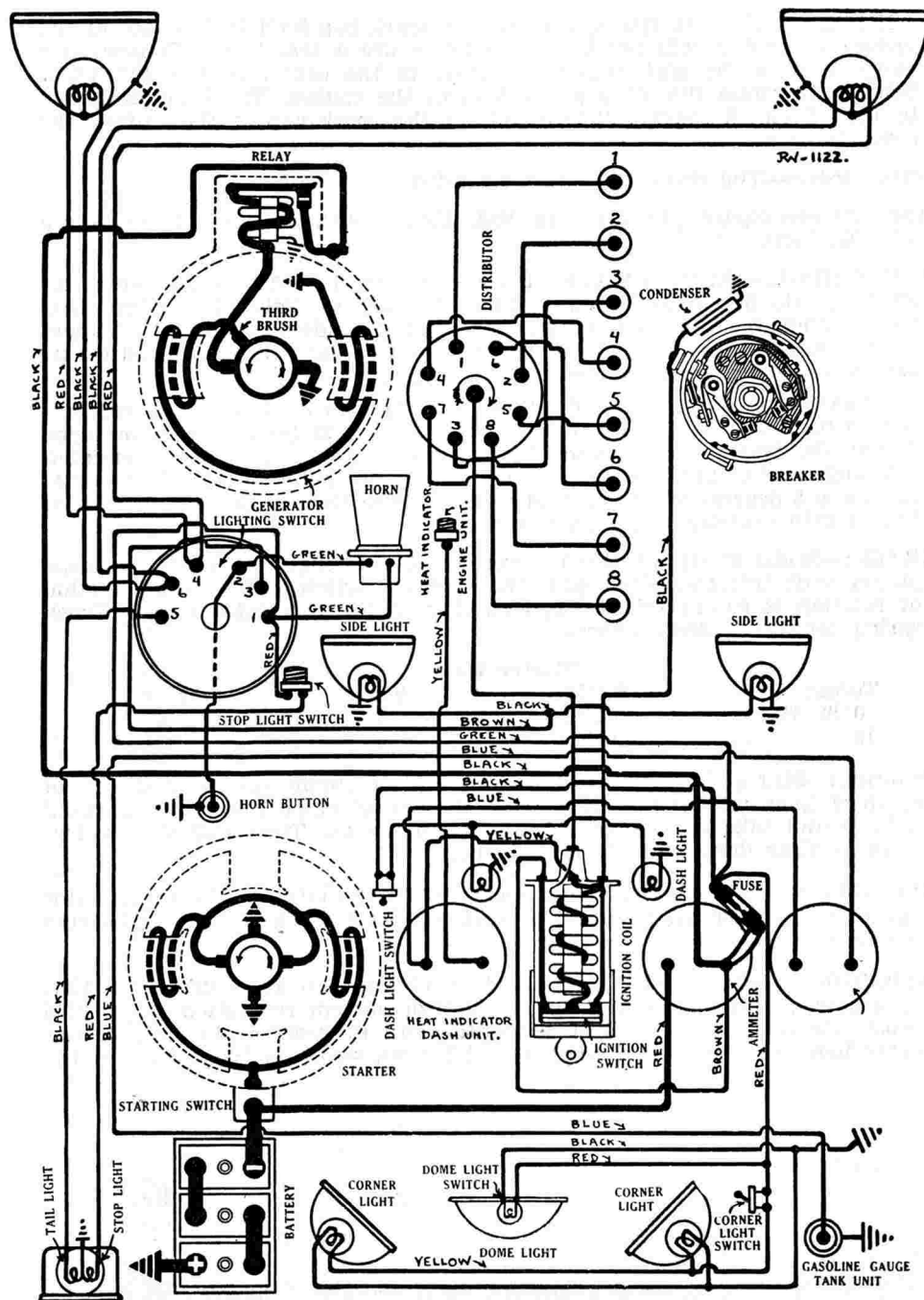
Distributor Model 660-D. Breaker contacts separate .018-.023 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. There are two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing. Distributor is semi-automatic. Maximum manual advance is 22 degrees (engine). Automatic advance begins at 800 R.P.M. of engine. Maximum automatic advance is 15 degrees reached at 2400 R.P.M. of engine. On Red Head engines the maximum automatic advance is 13.5 degrees reached at 2600 R.P.M.

Mounting:—Distributor is mounted at left of engine and is driven by an inclined shaft from the camshaft. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one full turn every month or each 1000 miles. At the same time remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. To synchronize contacts, use special Delco-Remy Tool, Part No. 1838182, and follow complete directions in Equipment Section. The contacts can be synchronized without special equipment, using the regular timing gauge, if an adaptor is available so that the gauge can be mounted in the spark plug port of cylinder No. 6. Remove No. 6 spark plug, mount gauge, set gauge at zero on top dead center and turn engine over until piston No. 6 reaches firing position. Then loosen the two lock screws on the movable sub-plate (on which the second set of contacts is mounted) and turn the eccentric adjusting screw until the contacts begin to open. Tighten the lock screws and check the contact gap. It must be within limits of .018-.024 inch.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position .037 inch before top dead center with the spark control in the fully advanced position. To set timing, first remove the 1/8 inch pipe plug in the cylinder head directly above No. 8 piston and screw the special micrometer gauge in place in the hole. Set breaker contact gap at .020 inch. Connect a six volt test lamp in series with the primary circuit by connecting one test lamp lead to the primary terminal on the distributor and the other lead to the relay terminal on the generator (if the battery is in the car). The lamp will remain lighted while the contacts are closed and will go out as soon as the contacts open. Fully advance spark control lever. Crank engine over until piston No. 8 reaches top dead center and set micrometer gauge at zero. Turn engine



DE SOTO EIGHT

MODEL CF (1931)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

utor until the lamp goes out, indicating that the contacts have begun to open. Tighten the clamp screw and check rotor to see that it is directly opposite No. 1 segment in the distributor head (see diagram). Check timing over until piston No. 1 enters compression stroke (the up stroke with both valves closed) and stop when the micrometer gauge reads .037 inch before top dead center. Then loosen advance arm clamp screw and rotate distributor by cranking engine over several times and then stopping with piston No. 1 on compression stroke at the exact instant the lamp goes out, indicating the firing position of piston No. 1. If the gauge reading is within the limits of .032-.042 inch, the setting is satisfactory. If gauge reading is outside these limits the engine must be retimed.

Special Note for Red Head Engines. Timing directions as given above apply on all Model CF engines with standard compression 5.2-1 or 5.4-1 heads. The procedure for timing engines equipped with the high compression (6.2-1) Red Heads is similar except that contacts separate with the piston .040 inch before top dead center and the limits are .035-.045 inch.

NOTE:—If the latest type timing gauge is used (with a spark gap built in the face of the gauge), it will not be necessary to use a test lamp. Connect one gauge lead to the coil high tension cable at the center terminal on the distributor cap and ground the other gauge lead to the engine. Turn on ignition. A spark will be visible in the gauge spark gap at the instant the contacts open.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-10. Gaps are .027-.030 inch.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1.407 inches. Stem diameter, .3405 inch. Stem length, 5¼ inches (from top of taper). Valve lift, 5/16 inch. Spring pressure, 40-44 pounds (valve closed) and 75-81 pounds (valve open). Tappet clearance, .005 inch (hot). Inlet valves open 4 degrees before top dead center and close 36 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, 1.407 inches. Stem diameter, .3405 inch. Stem length, 5¼ inches. Valve lift, 5/16 inch. Spring pressure, 40-44 pounds (valve closed) and 75-81 pounds (valve open). Tappet clearance, .007 inch (hot). Exhaust valves open 52 degrees before lower dead center and close 2 degrees before top dead center. Valve stem guides are removable.

STARTER:—**Model 714-Q.** Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal linkage. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3800	5.6	80
.4 "	3250	5.5	100
3 "	1500	5.0	200
6 "	800	4.5	300
9.4 "	350	4.0	400
13.0 "	Lock	3.5	500

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles. The drive end bearing is oilless.

GENERATOR:—**Model 943-L.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	760	0	6.4	850
6	7.0	1000	6	7.0	1200
10	7.4	1200	10	7.4	1600
16	8.0	2100	12.5	7.7	2300
12	7.7	3200	10	7.5	3200

Motoring, generator draws 3 amperes at 6 volts. Shunt field current is 4-5.9 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted on special hinge bracket at left of engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then remove two bolts holding generator on bracket and lift generator from place.

Belt Adjustment. The fan belt tension is adjusted by swinging the generator away from the engine. To make the adjustment, loosen the two bolts under the generator. Then loosen adjustment clamp bolt and pull generator out from the engine until the proper belt tension is secured. Tighten the clamp bolt and the mounting bolts. The belt tension should be just sufficient to drive the fan and generator without slipping. Any excessive belt tension will cause wear in the generator bearings.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles of operation.

RELAY:—**Model 265-G.** Relay is mounted on the generator. Relay contacts close at 750 R.P.M. when the generator voltage reaches 6.4-7 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9150.** Lighting switch is mounted at lower end of steering column. Headlights are equipped with double filament bulbs using the second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament. Dome light is 6-8 volt, 15 cp. S.C. Mazda 87. Corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Lighting fuse mounted back of the ammeter is 20 ampere capacity.

DE VAUX

MODEL 6-75 (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

NOTE:—At this date the De Vaux is not yet in active production. The data given below is correct for the first cars shown. Additional data will be published when available.

BATTERY:—U. S. L., Type 3-CVX-6X-6A. 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 115 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 21 hours. Battery is mounted on the left frame member under the floor boards of the front compartment.

IGNITION:—Coil Model IG-4082. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The engine temperature indicator, gasoline gauge and stop light are connected to an auxiliary terminal on the side of the coil.

Distributor Model IGB-4031. Breaker contacts separate .018-.022 inch. Set contact gap by loosening lock nuts on stationary contact mounting stud and turning up stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 20 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 24 degrees (engine) reached at 2400 R.P.M.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take off nut on hold-down stud in advance arm and lift distributor from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the side of the distributor head every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and put one drop of oil on the breaker arm pivot pin and put a small bit of vaseline on the face of the breaker cam.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18MM. Metric. Gaps are .025 inch.

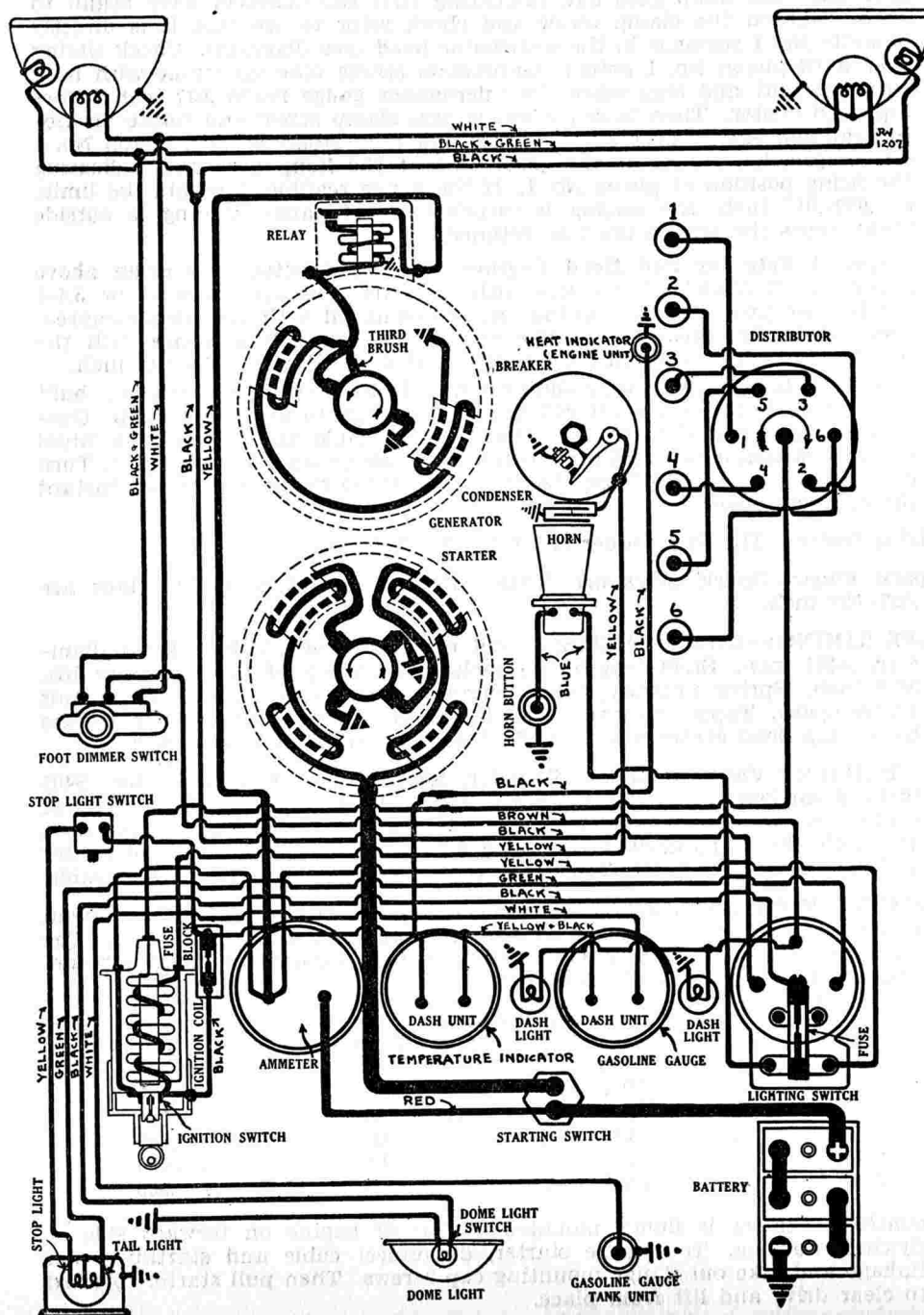
STARTER:—Model MAJ-4001. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 1¾-2½ pounds. Starter switch is Model SW-4003.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000-5000	6	50
3 " "	1350	6	50
5.5 " "	900	4.5	300
13.5 " "	Lock	3	550

Mounting:—Starter is flange mounted at left of engine on forward side of fly-wheel housing. To remove starter, disconnect cable and take off flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler on the drive end of the starter every month or each 1000 miles of operation.



MODEL 6-75 (1931)
AUTO-LITE GENERATING, STARTING SYSTEM
AUTO-LITE IGNITION

and slip off drive belt. Then loosen mounting clamp band and slip generator from place.

Generator Data		
Amperes	Volts	R.P.M.
0.....	6.2.....	600
8.....	7.1.....	900
17.....	8.0.....	1900
12.....	7.7.....	3200

Shunt field current is 4.5 amperes at 6 volts. Generator motoring draws 4.75 amperes at 6 volts. Brush spring tension is 24-32 ounces.

Mounting:—Generator is cradle mounted at left of engine and is driven by the fan belt. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

RELAY:—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Clum Lighting Switch Model 10741. Dimmer Switch Model 8871. Lighting switch is mounted on the instrument board. Headlights are double filament using a second 21 cp. filament controlled by a switch mounted on the toeboard instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking bulbs (in headlights) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament.

FUSES:—Lighting fuse mounted on switch is 20 ampere capacity. A separate fuse is mounted on the dash and connected in the auxiliary lead from the coil.

DODGE SIX

SERIES DH (1931) AFTER SERIAL NUMBER 3,518,001

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-1-13. 6 volt, 84 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 16.8 hours. Battery is mounted on left frame member.

IGNITION:—Coil Model 533-V. The ignition switch is built in the base of the coil. Coil is mounted on the rear of the dash with the ignition switch extending through to the face of the instrument panel. Ignition current is 1.5 amperes at 6 volts with engine running and 5 amperes at 6 volts with engine stopped.

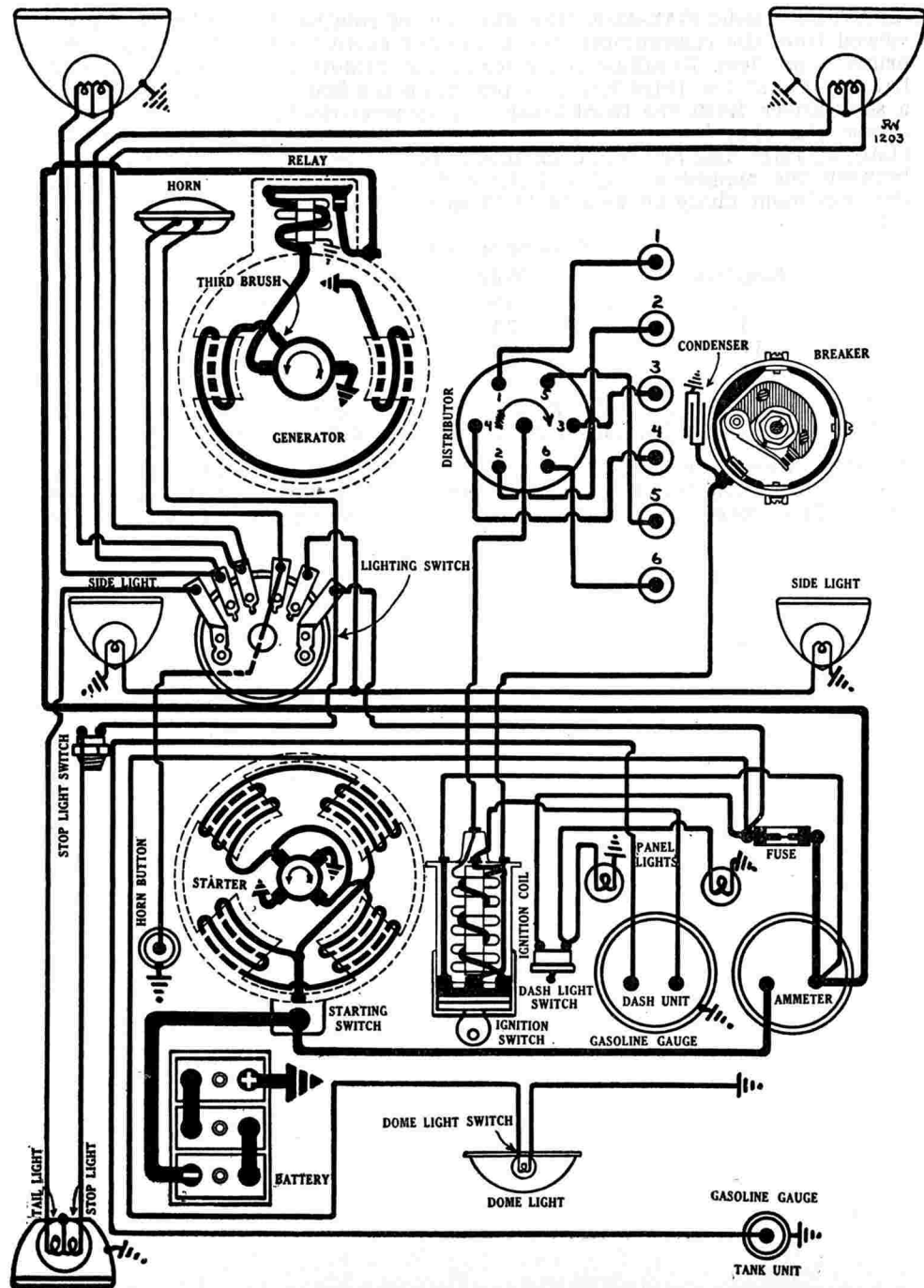
Distributor Model 632-K. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is full automatic. Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 13-15 degrees (engine) reached at 2000 R.P.M.

Mounting:—Distributor is mounted at the left of the engine and is driven by an inclined shaft from the camshaft. To remove distributor disconnect primary lead and remove distributor head with cables intact. Then take out hold-down screw at rear of advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one full turn every month or each 1000 miles. At the same time remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position .032 inch before top dead center. To set timing, first set breaker contact gap at .020 inch. Then remove the $\frac{1}{8}$ inch pipe plug from the cylinder head directly above No. 6 cylinder and screw the special timing micrometer gauge in place in the hole. Connect a small six volt lamp in the primary circuit (this can be done by connecting one lamp lead to the primary terminal of the distributor and the other lamp lead to the relay terminal of the generator. If the battery is out of the car, connect the lamp lead to a battery and ground the other battery terminal to the engine). Turn engine over and set micrometer at zero on top dead center. Crank the engine over until piston No. 1 is coming up on compression stroke (both valves will be closed) and stop when the gauge indicates the piston is .032 inch before top dead center. Remove distributor head and see that rotor is opposite No. 1 segment (see diagram). Loosen the advance arm clamp screw and rotate the distributor until the contacts begin to open, when the lamp will go out. Tighten the clamp screw and connect the spark plug leads in order 1-5-3-6-2-4 clockwise around the distributor head. Check the setting by cranking the engine over several times and then stopping with piston No. 1 on compression stroke at the point where the lamp goes out, indicating that the contacts have begun to open. If the gauge reading is within limits of .030-.034 inch before top dead center, the setting is satisfactory. If outside these limits the engine should be retimed.

NOTE:—If the new type timing gauge (with a visible spark gap built in the face of the gauge) is used, it will not be necessary to use a test lamp. One gauge lead should be clipped to the high tension lead at the center terminal in the distributor head and the other gauge lead should be



DODGE SIX

SERIES DH (1931) AFTER SERIAL NUMBER 3,518,001

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

grounded to the engine. The ignition should be turned on. A spark will be visible at the spark gap at the instant the contacts open.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-11. Gaps are .027-.030 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 17/32 inches. Stem diameter, .340-.341 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 42 pounds (valve closed), 78 pounds (valve open). Tappet clearance, .005 inch (hot). Inlet valves open 6 degrees after top dead center and close 46 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 15/32 inches. Stem diameter, .340-.341 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 42 pounds (valve closed) and 78 pounds (valve open). Tappet clearance, .007 inch (hot). Exhaust valves open 42 degrees before lower dead center and close 8 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 725-Q.** Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
16 "	Lock	3	600

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles. The drive end bearing is oilless.

GENERATOR:—**Model 943-R.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direc-

tion to decrease the charging rate. Tighten the screw after making the adjustment.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	760	0	6.4	850
6	7.0	1000	6	7.0	1200
10	7.4	1200	10	7.4	1600
16	8.0	2100	12.5	7.7	2300
12	7.7	3200	10	7.5	3200

Motoring, generator draws 3 amperes at 6 volts. Shunt field current is 3.5-4.5 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted on special hinge bracket at left of engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp belt. Swing generator toward engine and slip off drive belt. Then remove two bolts holding generator on bracket and lift generator from place.

Belt Adjustment. The fan belt tension is adjusted by swinging the generator away from the engine. To make the adjustment, loosen the two bolts under the generator. Then loosen adjustment clamp bolt and pull generator out from the engine until the proper belt tension is secured. Tighten the clamp bolt and the mounting bolts. The belt tension should be just sufficient to drive the fan and generator without slipping. Any excessive belt tension will cause wear in the generator bearings.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles of operation.

RELAY:—**Model 265-G.** Relay is mounted on the generator. Relay contacts close at 750 R.P.M. when the generator voltage reaches 6.4-7 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9150.** Lighting switch is mounted at lower end of steering column. Headlights are equipped with double filament bulbs using the second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament. Dome light is 6-8 volt, 15 cp. S.C. Mazda 87.

FUSES:—Lighting fuse mounted back of the ammeter is 20 ampere capacity.

DODGE EIGHT

SERIES DG (1931) AFTER SERIAL NUMBER 4,508,001

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-1-15. 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 105 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the left frame member.

IGNITION:—Coil model 533-V. The ignition switch is built in the base of the coil. Coil is mounted on the back of the dash with the ignition switch extending through to the face of the instrument panel. Ignition current is 1.5 amperes at 6 volts with engine running and 5 amperes at 6 volts with engine stopped.

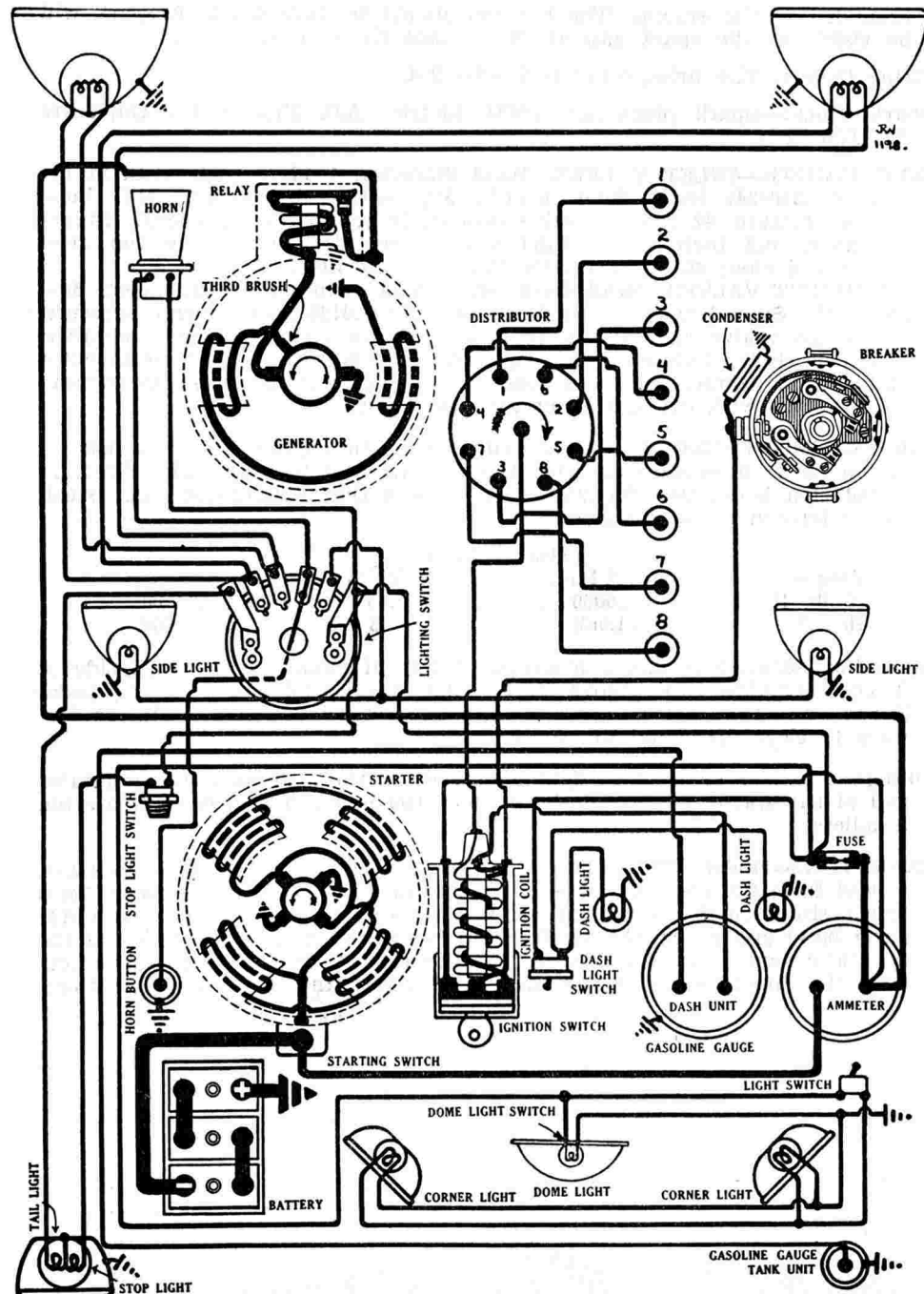
Distributor Model 660-G. Breaker contacts separate .018-.023 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. There are two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This interval must be accurately set by synchronizing the contacts for satisfactory performance. See Timing. Distributor is full automatic. Automatic advance begins at 800 R.P.M. of engine. Maximum automatic advance is 18 degrees reached at 3000 R.P. M.

Mounting:—Distributor is mounted at left of engine and is driven by an inclined shaft from the camshaft. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the shaft with medium cup grease and turn down one full turn every month or each 1000 miles. At the same time remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section. The contacts can be synchronized using the regular timing gauge if a special adapter is available so that the gauge can be mounted in the spark plug of cylinder No. 6. The gauge should be set at zero on top dead center and the engine turned over to firing position exactly as for timing (see next paragraph) and the lock screws on the movable sub-plate should be loosened and the eccentric adjusting screw turned until the second set of contacts (mounted on the sub-plate) begin to open. Tighten the lock screws and check the contact gap. It must be within limits of .018-.024 inch.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position .019 inch before top dead center. To set timing, take out the pipe plug in the cylinder head directly above No. 8 piston and screw the special micrometer gauge in this hole. Set breaker contact gap at .020 inch. Connect a six volt test lamp in the primary circuit to accurately determine the point at which contacts open. This can be done by connecting one test lamp lead to the primary terminal of the distributor and connecting the other lead to the relay terminal of the generator if the battery is in the car. Crank engine over until piston No. 8 is at top dead center and set micrometer gauge at zero. Then crank engine until piston No. 1 enters compression stroke (the up stroke with both valves closed). Turn engine over until the gauge reads .019 inch indicating that piston No. 1 is .019 inch before top dead center. Then loosen the advance arm clamp screw and rotate the distributor until the



DODGE EIGHT

SERIES DG (1931) AFTER SERIAL NUMBER 4,508,001

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

lamp goes out, indicating that the contacts have opened. Tighten the clamp screw and check the rotor to see that it is directly opposite the segment connected to the spark plug in cylinder No. 1 (see diagram). Check timing by cranking the engine over several times and then stop with piston No. 1 on compression stroke at the point at which the lamp goes out, indicating that the contacts are beginning to open. If the gauge reading is within limits of .017-.021 inch the ignition setting is satisfactory. If outside these limits the engine should be retimed. Connect the spark plugs in order 1-6-2-5-8-3-7-4 clockwise around the distributor head.

NOTE:—If the new type timing gauge (with a spark gap built in the face of the gauge) is used, it will not be necessary to use a test lamp. Clip one gauge lead to the high tension coil lead at the center of the distributor head and ground the other gauge lead to the engine. Turn on ignition. A spark will be visible at the spark gap on the gauge at the instant the contacts open.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. AC Type G-10. Gaps are .027-.030 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 13/32 inches. Stem diameter, .340-.341 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 42 pounds (valve closed), 78 pounds (valve open). Tappet clearance, .005 inch (hot). Inlet valves open 6 degrees after top dead center and close 46 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 13/32 inches. Stem diameter, .340-.341 inch. Stem length, 5 1/4 inches. Valve lift, .3125 inch. Spring pressure, 42 pounds (valve closed), 78 pounds (valve open). Tappet clearance, .007 inch (hot). Exhaust valves open 42 degrees before lower dead center and close 8 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 725-Q.** Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
16 "	Lock	3	600

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles. The drive end bearing is oilless.

GENERATOR:—**Model 943-R.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	760	0	6.4	850
6	7.0	1000	6	7.0	1200
10	7.4	1200	10	7.4	1600
16	8.0	2100	12.5	7.7	2300
12	7.7	3200	10	7.5	3200

Motoring, generator draws 3 amperes at 6 volts. Shunt field current is 3.5-4.5 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted on special hinge bracket at left of engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then remove two bolts holding generator on bracket and lift generator from place.

Belt Adjustment. The fan belt tension is adjusted by swinging the generator away from the engine. To make the adjustment, loosen the two bolts under the generator. Then loosen adjustment clamp bolt and pull generator out from the engine until the proper belt tension is secured. Tighten the clamp bolt and the mounting bolts. The belt tension should be just sufficient to drive the fan and generator without slipping. Any excessive belt tension will cause wear in the generator bearings.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles of operation.

RELAY:—**Model 265-G.** Relay is mounted on the generator. Relay contacts close at 750 R.P.M. when the generator voltage reaches 6.4-7 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9150.** Lighting switch is mounted at lower end of steering column. Headlights are equipped with double filament bulbs using the second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament. Dome lights is 6-8 volt, 15 cp. S.C. Mazda 87. Corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Lighting fuse mounted back of ammeter is 20 ampere capacity.

DUESENBERG

MODEL J (1931)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

BATTERY:—Exide, Type 3-LXRV-21-2G, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 164 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 30 hours. Battery is mounted on the right frame member under the dust shield.

IGNITION:—Coil Model 553-A, B (2 coil unit). The ignition switch is built in the base of the coils. Coil unit is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel.

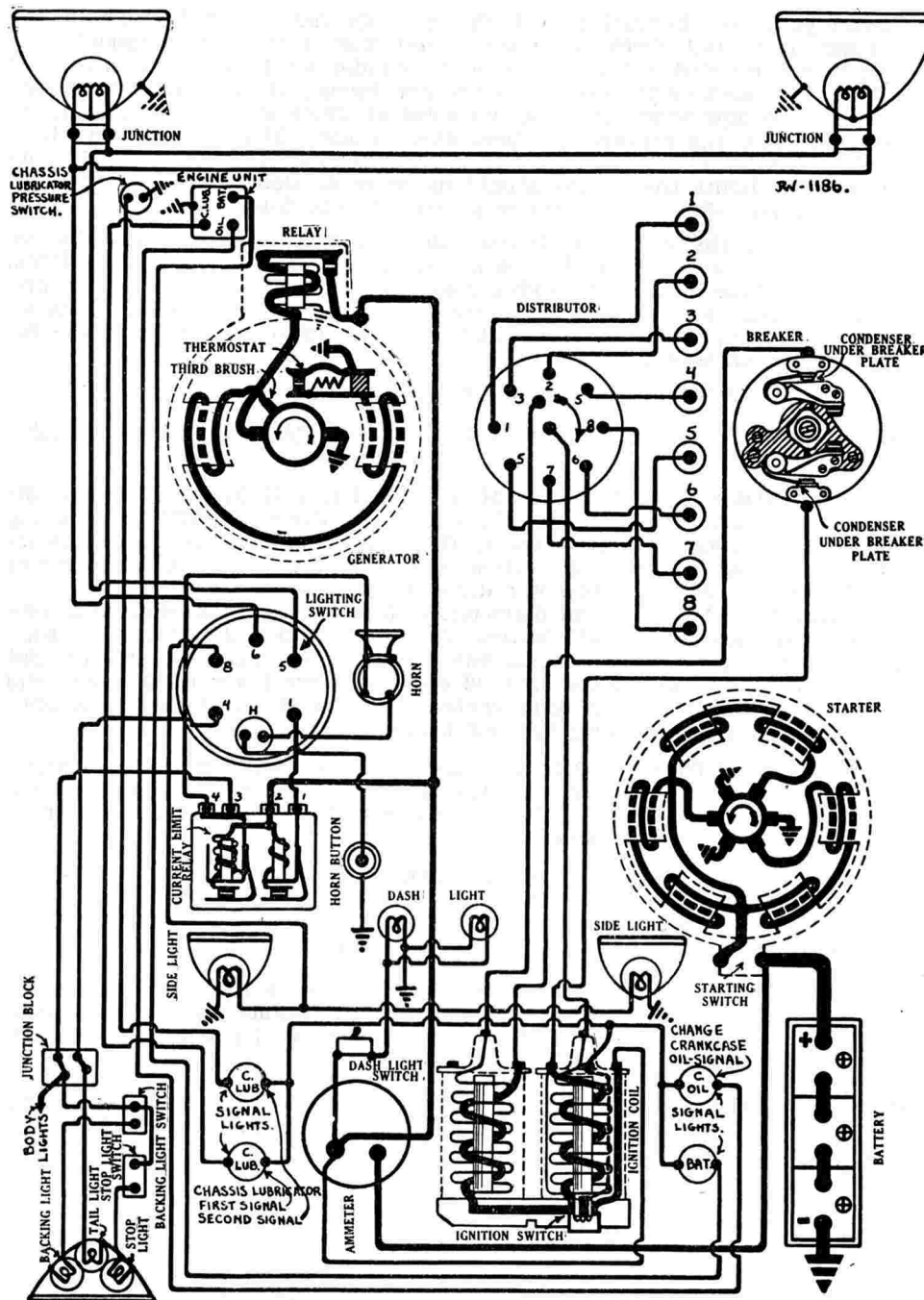
Distributor Model 4044 (SM1064) Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw until breaker gap is .022 inch with breaker arm on lobe of cam. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 20 degrees (engine). Automatic advance begins at 700 R.P.M. of engine. Maximum automatic advance is 20 degrees reached at 2000 R.P.M. of engine. Breaker has two sets of contacts operating on a single four sided cam. Each set of contacts controls one coil and fires the spark plugs in four cylinders. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See **Timing**.

Mounting:—Distributor is mounted on a bracket directly above the center of the left hand overhead camshaft on the top of the engine and is driven through spiral gears from the camshaft. The manual spark control operates through gears hidden in the base mounting flange. To remove distributor, disconnect primary leads and remove distributor head with cables intact. Then take out four mounting screws in distributor base mounting flange and lift distributor from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor housing every 1000 miles of operation. At the same remove the distributor head and rotor and put 4 or 5 drops of oil on top of the cam locking screw in the center of the shaft and 1 or 2 drops of oil on the breaker arm pivot pins. Put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. The second set of contacts mounted on movable sub-plate begin to open exactly 45 degrees after the first set mounted directly on the breaker plate. Synchronize contacts on a rotary spark gap or turn engine over exactly 90 degrees from firing position of piston No. 1 after distributor has been timed to the engine when piston No. 6 will reach firing position (6 degrees after top dead center with manual spark control retarded). If the second set of contacts do not open at this point, loosen the two lock screws on the movable sub-plate and turn the eccentric adjusting screw until contacts open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position 6 degrees on the flywheel after top dead center with the manual spark control fully retarded. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully retard spark control lever and turn engine over until the ignition mark on the flywheel, which is 6 degrees



DUESENBERG

MODEL J (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

after the top dead center mark $\frac{1}{8}$ is directly opposite the reference line on the flywheel housing. Then loosen lock screw in center of breaker cam and carefully locate cam so that the first set of contacts are beginning to open. Tighten the screw and see that the rotor is directly opposite the segment connected to the spark plug in cylinder No. 1.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18MM. Metric. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES:**—Head diameter, $1\frac{1}{2}$ inches. Stem diameter, $11/32$ inch. Stem length, $5\frac{1}{8}$ inches. Valve lift, .350 inch. Spring pressure, 65 pounds (valve closed) 105 pounds (valve open). Tappet clearance, .015 inch. Inlet valves open 6 degrees before top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, $1\frac{7}{16}$ inches. Stem diameter, $11/32$ inch. Stem length, $5\frac{1}{8}$ inches. Valve lift, .360 inch. Spring pressure, 65 pounds (valve closed) 105 pounds (valve open). Tappet clearance, .015 inch. Exhaust valves open 40 degrees before lower dead center and close 14 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

NOTE:—This engine has two inlet valves and two exhaust valves per cylinder. The exhaust valves are located in the cylinder head at the right of the engine and are operated directly by the right overhead camshaft. The inlet valves are at the left of the cylinder head and are operated by the left hand overhead camshaft. Both camshafts are chain driven from a transfer sprocket on the front of the engine block. The transfer sprocket is chain driven from the crankshaft.

STARTER:—Model 429. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 36-40 ounces. The starting switch is mounted on the starter field frame.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5	70
19 "	Lock	3	500

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect starting switch control wire and cables and take out three flange mounting bolts. Then pull starter forward to clear drive and lift from place.

Oiling:—Starter bearings are oilless. They require no attention.

GENERATOR:—Model 428. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F . cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, loosen the commutator cover band and shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush is held in any position by friction.

Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8.3-8.7	1200	11-13	7.5-7.8	1450

Shunt field current is 3.2-4.1 amperes at 6 volts. Brush spring tension is 20-24 ounces. Generator motoring draws 4.5 amperes at 6 volts.

Mounting:—Generator is cradle mounted at left of engine and is driven by the accessory drive shaft. To remove generator, disconnect lead and drive coupling and loosen mounting clamp band. Then slide generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 1000 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay contacts close when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 486-D. Lighting switch is mounted at lower end of steering column. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing lights are each 6-8 volt, 21 cp. S.C. Mazda 1129.

CURRENT LIMIT RELAY:—Model 5759. This device consists of a vibrating and lock-out circuit breaker mounted on the left side of the dash. The vibrating circuit breaker is connected in the lighting circuits to protect them from overload and short-circuits. It begins to vibrate when the current reaches 25-30 amperes and continues limiting the current to 5-15 amperes. The lock-out circuit breaker connected in the horn and stop light circuits begins to operate when the current reaches 25-30 amperes and continues limiting the current to less than 1 ampere. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed. Spring tension at plunger is 5 ounces (minimum).

DU PONT

MODEL G (1930-31)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Exide, Type 3-XC-15-1. 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 114 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the left frame member.

IGNITION:—Coil Model 528-C (2 used). Ignition coils are mounted on the dash. Ignition current is 1.5 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped for each coil.

Distributor Model 668-B. (SM-1084). Breaker contacts separate .022 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine). Automatic advance begins at 800 R.P.M. of the engine. Maximum automatic advance is 15 degrees reached at 4200 R.P.M. Breaker has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Each set of contacts controls one ignition coil and fires the spark plugs in four cylinders. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance.

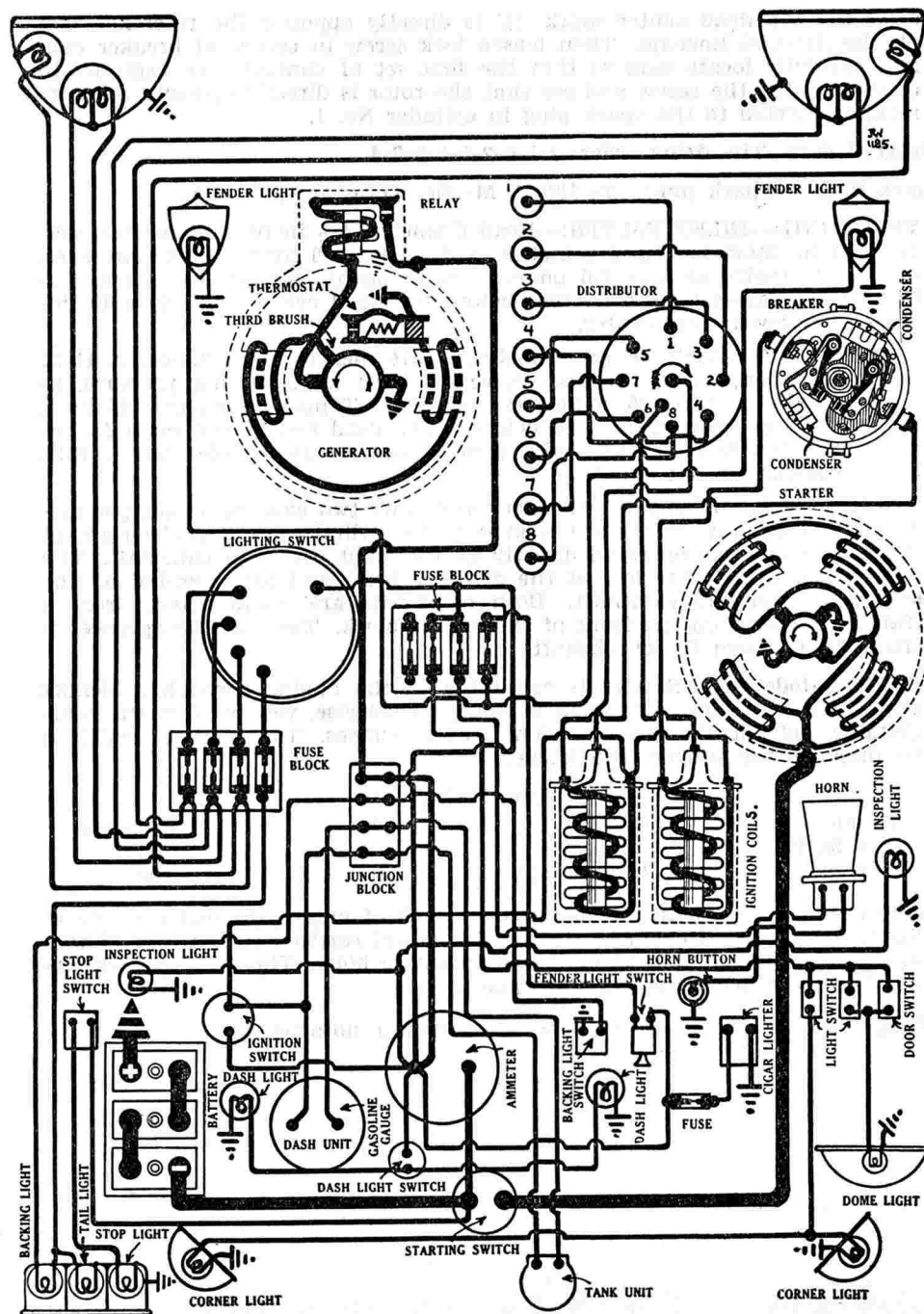
Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual control rod and primary lead and remove distributor head with cables intact. Then take out stop screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor housing with medium cup grease and turn down two turns every month or each 1000 miles. At the same time remove the distributor head and rotor and saturate the wick in the oiler in the center of the shaft with light machine oil and put a small bit of vaseline on the face of the breaker cam.

TIMING:—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 1835009, and follow complete directions in equipment section. Breaker contacts can be synchronized without special equipment after distributor has been timed to engine by cranking the engine over exactly 90 degrees when piston No. 6 will reach firing position (top dead center with manual spark control fully retarded). If the second set of contacts (mounted on the movable sub-plate) do not begin to open at this point, loosen the lock screws and turn the eccentric adjusting screw until the contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch with breaker arm on lobe of cam, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches top dead center with the manual spark control fully retarded. To set timing, crank engine over until piston No. 1 enters compression stroke. This is the up stroke with both valves closed. Retard the spark lever. Continue to crank engine until piston reaches top dead center. Then loosen advance arm clamp screw and rotate the distributor until the contacts begin to open. Tighten the clamp screw and connect the segment directly opposite the rotor to the spark plug in cylinder No. 1. Connect the remaining spark plugs as shown on the diagram clockwise around the distributor head.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.



DU PONT

(1931) MODEL G (1930-31)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

Spark Plugs:—Engines with aluminum head use $\frac{7}{8}$ -18 S.A.E. Standard Short. Spark plugs in engines with cast iron heads are 18MM. Metric Short. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, $1\frac{1}{2}$ inches. Stem diameter, $\frac{3}{8}$ inch. Stem length, $5\frac{1}{2}$ inches. Valve lift, .370 inch. Tappet clearance, .006 inch. Inlet valves open 5 degrees after top dead center and close 50 degrees after lower dead center.

EXHAUST VALVES. Head diameter, $1\frac{3}{8}$ inches. Stem diameter, $\frac{3}{8}$ inch. Stem length, $5\frac{1}{2}$ inches. Valve lift, .370 inch. Tappet clearance, .008 inch. Exhaust valves open 40 degrees before lower dead center and close 5 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model 720-Q. (SM-1083). Starter is connected to the engine through an outboard Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces. Starter switch is Model 406-A.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	65
15 "	Lock	3.15	570

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect starter cable. Then take out flange mounting cap screws and pull starter forward to clear drive. Lift from place.

Oiling:—Put 4 or 5 drops of light machine oil in the oiler on the commutator end of the starter every month or each 1000 miles. The drive end bearing is oilless.

GENERATOR:—Model 945-U. (SM-1082). The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, loosen the small round headed screw on the commutator end

plate and remove the commutator cover band. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 20 amperes (cold) reached at 1300 R.P.M. or 24 M.P.H.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.3	1300	9-12	7.35-7.65	1300-1500

Motoring, generator draws 5.5 amperes at 6 volts. Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces.

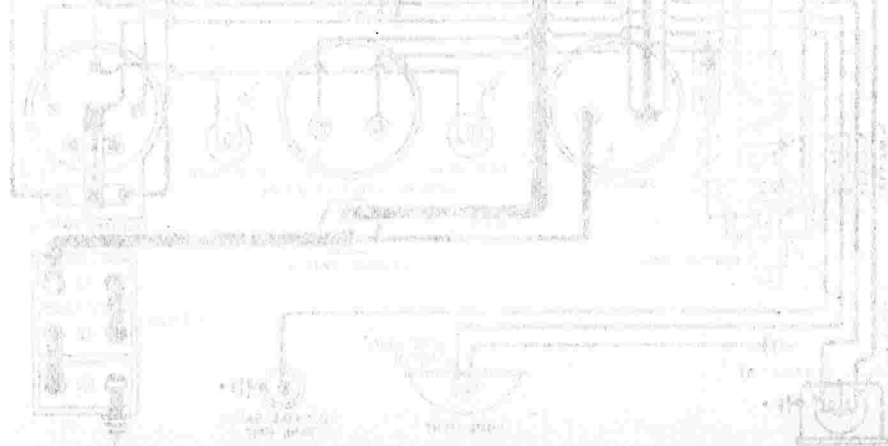
Mounting:—Generator is flange mounted at left of engine on rear of timing chain case. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling and take out flange mounting cap screws. Then pull generator to the rear and lift it from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay contacts close when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Contacts separate .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Soreng Manegold Switch. Lighting switch is mounted at lower end of steering column. Headlights are double filament using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights (on fenders) are 6-8 volt, 3 cp. S.C. Mazda 63. Auxiliary headlights are 6-8 volt, 6 cp. S.C. Mazda 81. Stop and backing lights are 6-8 volt, 21 cp. S.C. Mazda 1129. Instrument lights, inspection lights, dome reading lights and tail light are each 6-8 volt, 3 cp. S. C. Mazda 63.

FUSES:—Lighting fuses mounted in two fuse boxes are 15 ampere capacity. A separate fuse mounted on the dash is connected in the cigar lighter circuit.



MODEL 4-07 (1930) 6-10 (1931)
AUTO-LITE GENERATING, STARTING SYSTEM
AUTO-LITE IGNITION

BATTERY:—U.S.L., Type 3-CVX-6X-6A. 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 115 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 21 hours. Battery is mounted on right frame member under the floor boards of the front compartment.

IGNITION:—Coil Model IG-4082. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The gasoline gauge and stop light are connected to an auxiliary terminal on the side of the coil.

Distributor Model IGB-4043. Breaker contacts separate .018-.022 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard ollstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 20 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 24 degrees (engine) reached at 2400 R.P.M.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take off nut on hold-down stud in advance arm and lift distributor from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the side of the distributor head every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and put one drop of oil on the breaker arm pivot pin and put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position 8 degrees or $2\frac{1}{2}$ teeth on the flywheel before top dead center with the spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance spark control and see that distributor is rotated counter-clockwise as far as possible. Turn engine over until a point on the flywheel $2\frac{1}{2}$ teeth before the top dead center mark is directly opposite the indicator on the flywheel case. Then loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and see that the segment directly opposite the rotor in the distributor head is connected to the spark plug in cylinder No. 1. Spark plug connections are shown on the diagram.

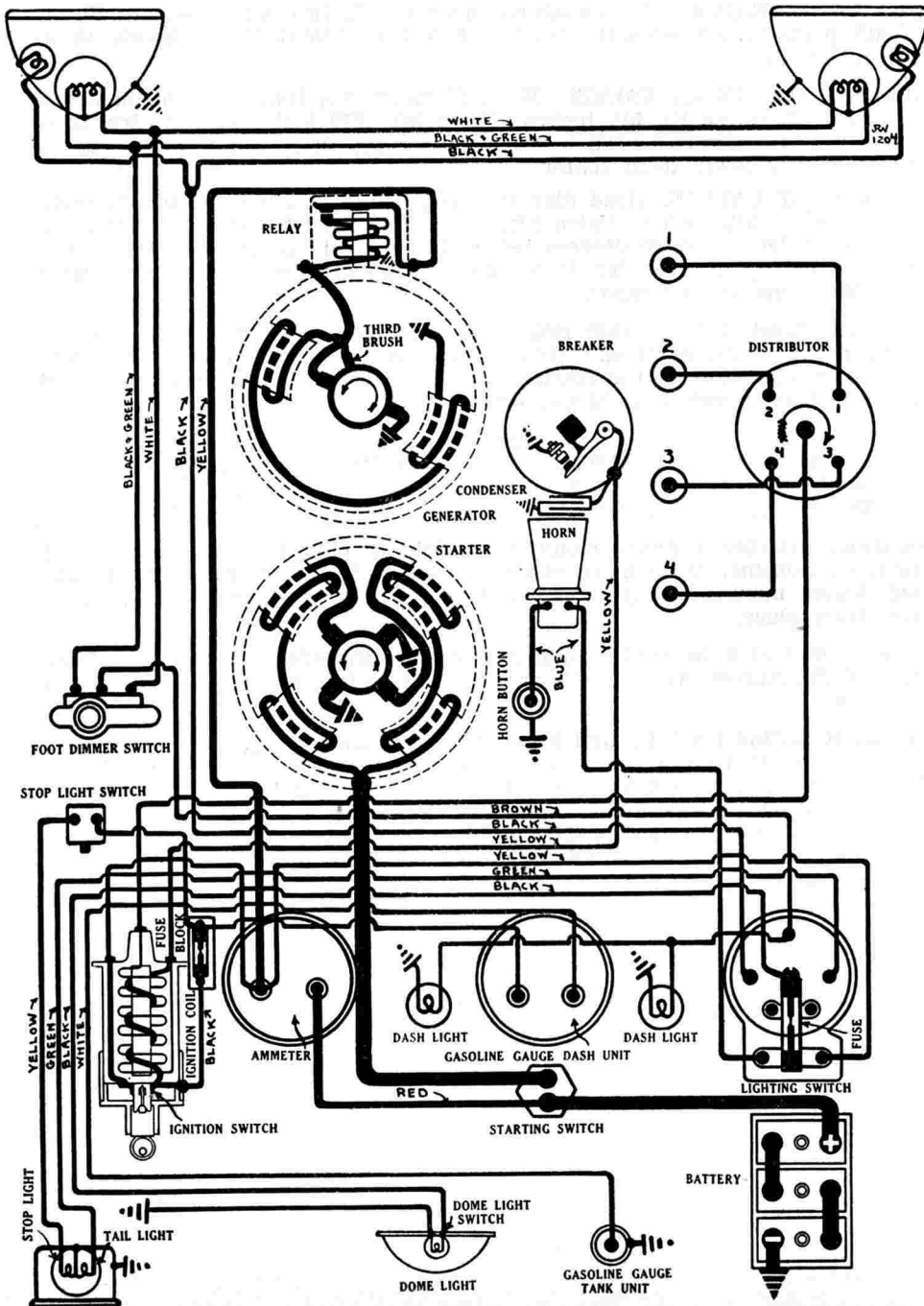
Firing Order:—The firing order is 1-3-4-2.

Spark Plugs:—Spark plugs are 7/8-18 S.A.E. Std. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1 53/64 inches. Stem diameter, 3/8 inch. Stem length, 5 1/16 inch. Valve lift, 1/4 inch. Tappet clearance, .008 inch (hot). Inlet valves open at top dead center and close 46 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 11/16 inch. Stem diameter, 3/8 inch. Stem length, 5 1/16 inches. Valve lift, 1/4 inch. Tappet clearance, .008 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 6 degrees after top dead center.

STARTER:—Model MAJ-4007. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from



DURANT

MODEL 4-07 (1930) 6-10 (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

the commutator end. Brush spring tension is $1\frac{3}{4}$ - $2\frac{1}{4}$ pounds. Starter switch is Model SW-4003.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000-5000	6	50
3 "	1350	5	200
5.5 "	900	4.5	300
13.5 "	Lock	3	550

Mounting:—Starter is flange mounted at left of engine on forward side of fly-wheel housing. To remove starter, disconnect cable and take out two flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler on the drive end of the starter every month or each 1000 miles of operation.

GENERATOR:—Model GAL-4330. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush and mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting the maximum charging rate is 16-17 amperes at 8 volts reached at 1900 R.P.M. or 24 M.P.H.

Generator Data		
Amperes	Volts	R.P.M.
0	6.2	600
8	7.1	900
17	8.0	1900
12	7.7	3200

Shunt field current is 4.5 amperes at 6 volts. Generator, motoring, draws 4.75 amperes at 6 volts. Brush spring tension is 24-32 ounces.

Mounting:—Generator is cradle mounted at left of engine and is driven by the fan belt. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling and slip off drive belt. Then loosen mounting clamp band and slip generator from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every week or each 500 miles of operation.

RELAY:—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 650 R.P.M. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Clum Lighting Switch Model 5192. Dimmer Switch Model 8871. Lighting switch is mounted on the instrument board. Headlights are double-filament using a second 21 cp. filament controlled by a switch mounted on the toeboard instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking bulbs (in headlights) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament.

FUSES:—Lighting fuse mounted on switch is 20 ampere capacity. A separate fuse is mounted on the dash and connected in the auxiliary lead from the coil.

DURANT

MODELS 6-12 AND 6-14 (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—U.S.L., Type 3-CVX-6X-6A, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 115 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 21 hours. Battery is mounted on right frame member under the floor boards of the front compartment.

IGNITION:—Coil Model IG-4082. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The engine temperature indicator, gasoline gauge and stop light are connected to an auxiliary terminal on the side of the coil.

Distributor Model IGB-4031. Breaker contacts separate .018-.022 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 20 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 24 degrees (engine) reached at 2400 R.P.M.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take off nut on hold-down stud in advance arm and lift distributor from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the side of the distributor head every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and put one drop of oil on the breaker arm pivot pin and put a small bit of vaseline on the face of the breaker cam.

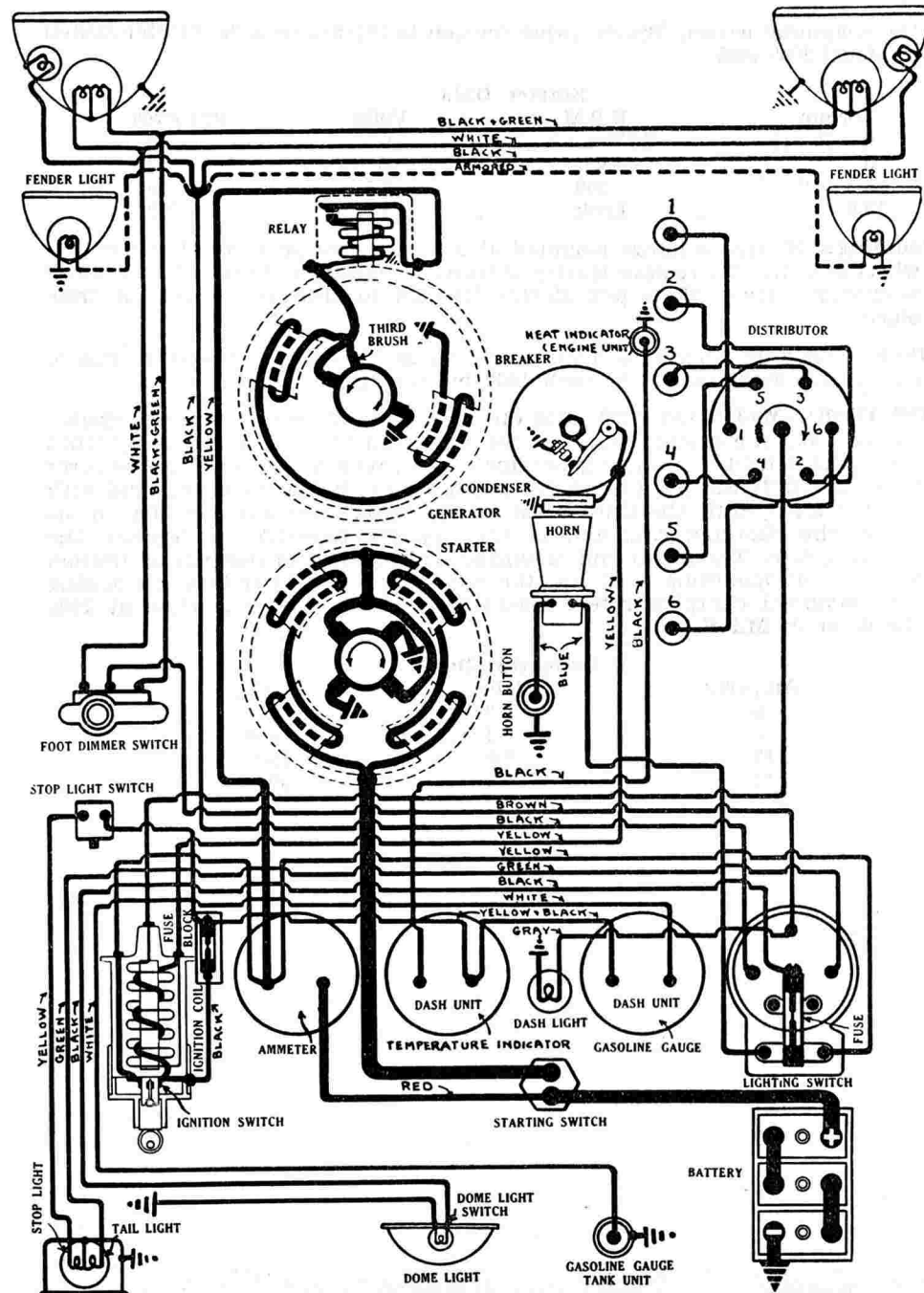
Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position 6 degrees or two teeth on the flywheel before top dead center with the spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance spark control and see that distributor is rotated counter-clockwise as far as possible. Turn engine over until a point on the flywheel two teeth before the top dead center mark is directly opposite the indicator on the flywheel case. Then loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and see that the segment directly opposite the rotor in the distributor head is connected to the spark plug in cylinder No. 1. Spark plug connections are shown on the diagram.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18MM. Metric. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES:—Head diameter, 1 9/16 inches. Stem diameter, 11/32 inch. Stem length, 5 9/32 inches. Valve lift, 5/16 inch. Spring pressure, 45 pounds (valve closed) 80 pounds (valve open). Tappet clearance, .008 inch (hot). Inlet valves open 5 degrees after top dead center and close 45 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, 1 7/16 inches. Stem diameter, 11/32 inch. Stem length, 5 9/32 inches. Valve lift, 5/16 inch. Spring pressure, 45 pounds (valve closed) 80 pounds (valve open). Tappet clearance, .008 inch



DURANT

MODELS 6-12 AND 6-14 (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

(hot). Exhaust valves open 40 degrees before lower dead center and close 5 degrees after top dead center. Valve stem guides are removable. Tappet clearance should be set at .012 inch in checking valve timing.

STARTER:—Model MAJ-4001. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 1¾-2¼ pounds. Starter switch is Model SW-4003.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.....	3000-5000	6	50
3 "	1350	5	200
5.5 "	900	4.5	300
13.5 "	Lock	3	550

Mounting:—Starter is flange mounted at left of engine on forward side of fly-wheel housing. To remove starter, disconnect cable and take off flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler on the drive end of the starter every month or each 1000 miles of operation.

GENERATOR:—Model GAL-4130. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush and mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting the maximum charging rate is 16-17 amperes at 8 volts reached at 1900 R.P.M. or 24 miles per hour.

Generator Data

Amperes	Volts	R.P.M.
0.....	6.2.....	600
8.....	7.1.....	900
17.....	8.0.....	1900
12.....	7.7.....	3200

Shunt field current is 4.5 amperes at 6 volts. Generator motoring draws 4.75 amperes at 6 volts. Brush spring tension is 24-32 ounces.

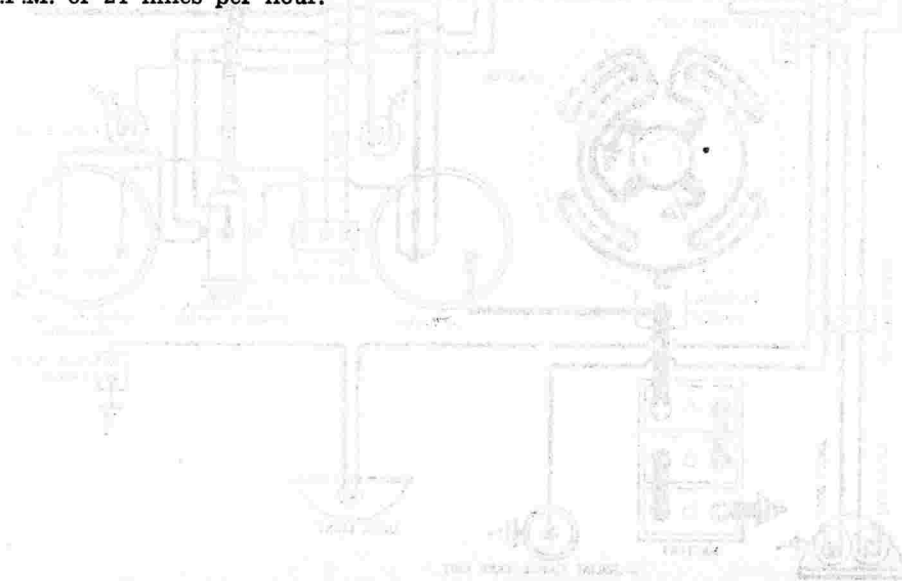
Mounting:—Generator is cradle mounted at left of engine and is driven by the fan belt. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling and slip off drive belt. Then loosen mounting clamp band and slip generator from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every week or each 500 miles of operation.

RELAY:—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Clum Lighting Switch Model 5192. Dimmer Switch Model 8871. Lighting switch is mounted on the instrument board. Headlights are double-filament using a second 21 cp. filament controlled by a switch mounted on the toeboard instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking bulbs (in headlights) or fender lights (used as special equipment) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament.

FUSES:—Lighting fuse mounted on switch is 20 ampere capacity. A separate fuse is mounted on the dash and connected in the auxiliary lead from the coil.



ESSEX

NEW SUPER SIX (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—Exide, Type 3-XI-13-1G. 6 volt, 105 ampere hour. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 17 hours. Battery is mounted on the left frame member under the driver's seat.

IGNITION:—Coil Model CE-4015. Coil is mounted on the engine cylinder head. Ignition current is 2 amperes at 6 volts with engine running and 5 amperes at 6 volts with engine stopped. The ignition switch is a Type 9-B Electrolock. The Electrolock must be removed with the distributor as a unit.

Distributor Model IGB-4033. Breaker contacts separate .018-.020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until correct gap is secured with the breaker arm on lobe of cam. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is full automatic. Maximum automatic advance is 10 degrees.

Mounting:—Distributor is mounted on accessory drive bracket at right of engine. To remove distributor, disconnect Electrolock at dash and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place. The Electrolock can be removed from the distributor by following complete directions given under 'Electrolock' in Equipment Section.

Oiling:—Fill the oiler on the side of the distributor housing with light engine oil every 2000 miles. At the same time remove the distributor head and rotor and put a few drops of oil on the breaker arm pivot pin and coat the face of the breaker cam with a light film of vaseline or grease.

Timing:—Breaker contacts begin to separate when the piston entering power stroke reaches top dead center with the breaker assembly in the fully retarded position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Loosen clamp screw in advance arm slot and rotate distributor clockwise as far as possible. Continue to crank engine over until the flywheel mark 'DC 1&6' is directly opposite the pointer in the inspection hole in the flywheel case at the right of the engine. Then loosen advance arm clamp bolt and rotate distributor counter-clockwise until the contacts begin to open. Check to see that the segment directly opposite the rotor is connected to the spark plug in cylinder No. 1 and connect the remaining spark plugs in order 5-3-6-2-4 clockwise around the distributor head.

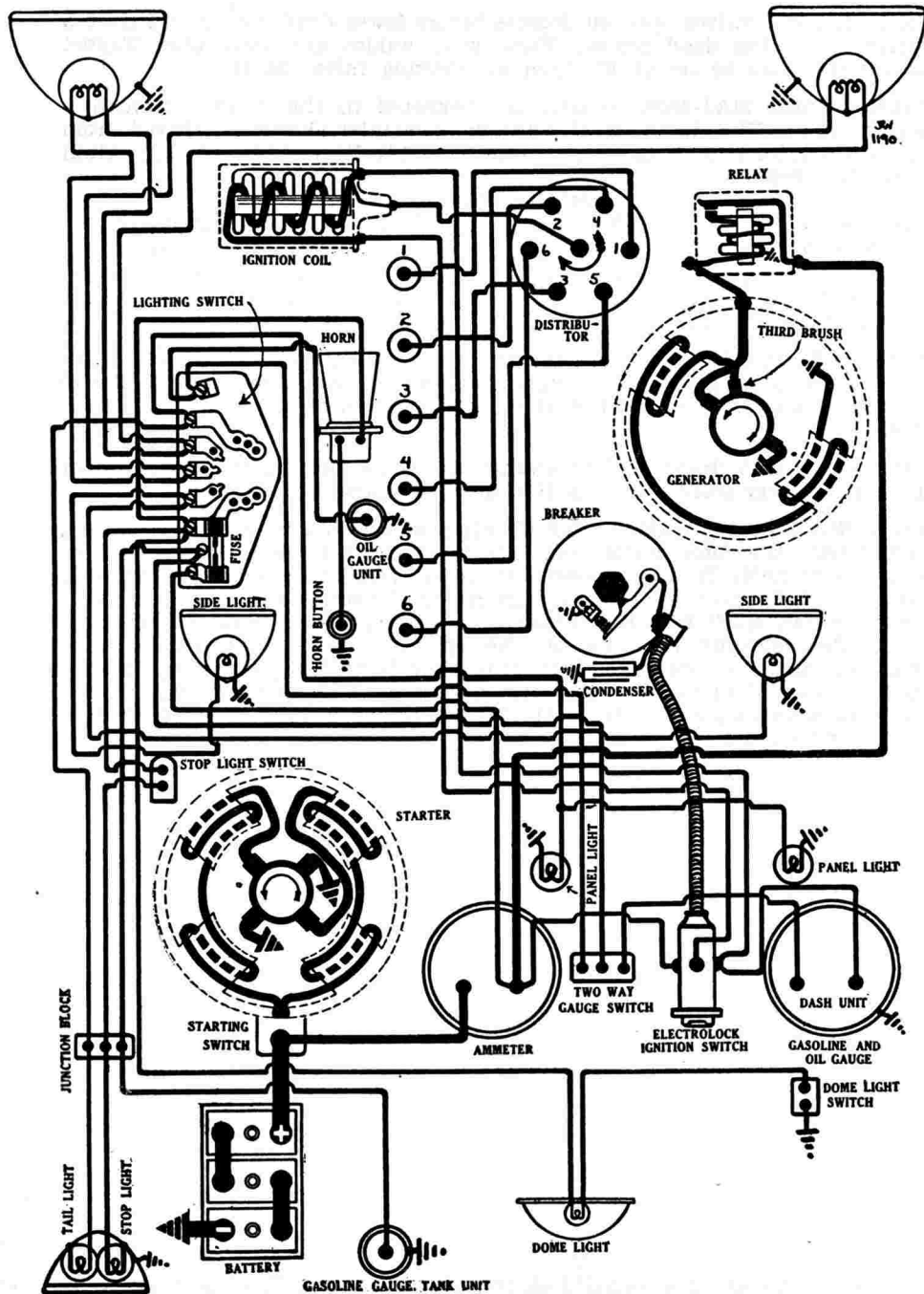
Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-10. Gaps are .022 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1½ inches. Stem diameter, .3085 inch. Stem length, 5 1/32 inches. Valve lift, 5/16 inch. Spring pressure, 50 pounds (valve closed). Tappet clearance, .003-.005 inch (hot).

EXHAUST VALVES. Head diameter, 1¾ inches. Stem diameter, .3085 inch. Stem length, 5 1/32 inches. Valve lift, 21/64 inch. Spring pressure, 50 pounds (valve closed). Tappet clearance, .005-.007 inch (hot). Valve stem guides are removable. Valves with oversize stems are not made.

Valve Timing. To check valve timing, set tappet clearance of No. 1 inlet valve at correct figure and then turn engine over until the inlet opening mark on the flywheel 'IO' which is 7 degrees past the top dead center



ESSEX

NEW SUPER SIX (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

mark 'DC 1&6' is directly opposite the pointer in the inspection hole in the front face of the flywheel housing at the right of the engine. The tappet clearance should be entirely taken up and inlet valve in No. 1 cylinder should begin to open at this point.

STARTER:—Model MAJ-4009. Starter is connected to the engine through an inboard Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter cranks the engine at 125 R.P.M. drawing 125 amperes at 5.5 volts. Brush spring tension is 2½-3 pounds. The starter switch is mounted on the starter field frame and is operated through a flexible control by a button on the dash.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000-5000	6	50
3 "	1350	5	200
5.5 "	900	4.5	300
13.5 "	Lock	3	550

Mounting:—Starter is flange mounted at left of engine on forward face of flywheel housing. To remove starter, disconnect cable and lead to ammeter. Remove starter switch control wire. Then take out three flange mounting cap screws. Pull starter forward to clear drive and lift from place.

Oiling:—Put 3 or 4 drops of light engine oil in the oiler at each end of the starter armature shaft every 1000 miles of operation.

GENERATOR:—Model GAM-4102. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, loosen the commutator cover band and shift the third brush by tapping on the brush mounting plate with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush and mounting plate are held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 14-16 amperes (cold)

at 8 volts reached at 1900 R.P.M. or 23 miles per hour.

Generator Data		
Amperes	Volts	R.P.M.
0	6.5	620
2	6.9	710
5	7.1	830
10	7.8	1090
14	7.9	1490
15	8.0	1900

Shunt field current is 6.5 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts. Brush spring tension is 1¼-1½ pounds.

Mounting:—Generator is cradle mounted at right of engine and is driven through a flexible hose coupling from the accessory drive shaft. To remove generator, disconnect lead and drive coupling and loosen mounting clamp band. Then slide generator from place.

Oiling:—Put 3 or 4 drops of light engine oil in the oiler at each end of the generator every 1000 miles.

RELAY:—Model CB-4016. Relay is mounted on the generator end plate. Relay closes at 900 R.P.M. or 11 M.P.H. when generator voltage reaches 7 volts and opens with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Soreng-Manegold Lighting Switch. Lighting switch is mounted at lower end of steering column. The lighting fuse is mounted on the switch and two extra terminals are provided which serve as junctions for the oil and gasoline gauge lines. Headlights are fitted with double filament bulbs using a second 21 cp. filament instead of dimmer. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights or side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87.

FUSES:—Lighting fuse mounted on lighting switch is 20 ampere capacity.

FORD

NEW MODEL A (1930-31)

FORD GENERATING, STARTING SYSTEM FORD IGNITION

BATTERY:—Ford, 13 plates, 6 volt, 80 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 16 hours. Battery is mounted under the front floor boards on the left frame member.

IGNITION:—Ignition coil is mounted on the dash directly above junction box. Ignition current is $1\frac{3}{4}$ amperes at 7 volts with engine running and $4\frac{1}{2}$ amperes at 6 volts with engine stopped.

Breaker contacts separate .018-.022 inch. Adjust contact opening by loosening lock screw on stationary contact mounting bracket and turning up stud until correct gap is obtained with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 14-20 ounces. Distributor is full manual type. Maximum manual advance is 14 degrees.

Mounting:—Distributor is mounted on the cylinder head between cylinders two and three. To remove breaker plate, disconnect cable in center of cap and four spring connectors to spark plugs, loosen clips and take off cap and terminal assembly. Then loosen lock screw in center of breaker cam and remove cam. Disconnect manual advance rod and turn breaker plate until projections on plate line up with grooves in housing. Then lift breaker plate straight up. The distributor housing can be removed if necessary by loosening the lock nut and backing out the mounting stud on the right side of the engine block directly opposite the distributor mounting. The ignition switch is an Electrolock Type 6-A which is permanently connected to the distributor housing by an armored cable.

Oiling:—Put a few drops of light engine oil in the oiler on the side of the distributor every two weeks or each 500 miles. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

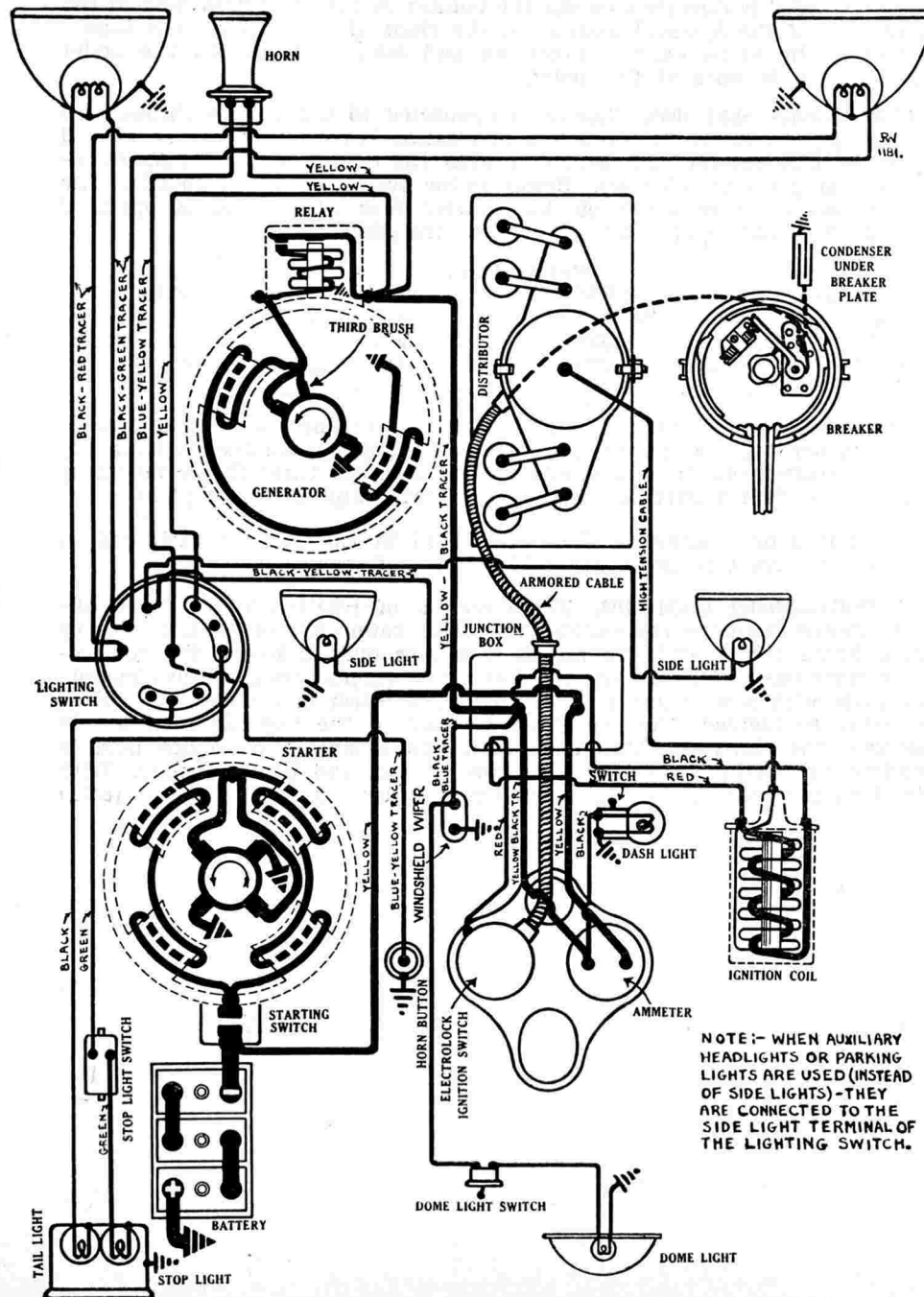
Timing:—Breaker contacts begin to separate when the piston entering power stroke reaches top dead center with the manual spark control lever in the fully retarded position. To set timing, fully retard spark control lever and take out timing pin which is screwed in front of gear case directly over the camshaft gear. Reverse the pin in the hole and turn engine over slowly, pressing on the pin meanwhile, until the pin drops into the recess in the face of the camshaft gear. This is the top dead center position for piston No. 1. Then remove distributor cap and rotor and loosen the lock screw in the center of the cam. Replace rotor and turn cam until rotor button is directly opposite No. 1 segment (right hand segment on front of distributor housing facing radiator). Remove rotor and shift cam slightly until contacts are just beginning to open. Tighten the lock screw. **Be careful to withdraw timing pin and screw it firmly in place in original position before the engine is run.**

Firing Order:—The firing order is 1-2-4-3. Number one cylinder nearest the radiator.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Standard. Gaps are .035 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1.532-1.547 inches. Stem diameter, .3105-.3115 inch. Stem length, 5.651 inches. Valve lift, .287 inch. Spring pressure, 34-38 pounds (spring length, $2\frac{1}{2}$ inches). Tappet clearance, .010-.013 inch (cold). Inlet valves open $7\frac{1}{2}$ degrees before top dead center and close $48\frac{1}{2}$ degrees after lower dead center.

EXHAUST VALVES. Head diameter, stem diameter, stem length, lift, spring pressure, and tappet clearance same as inlet valves. Exhaust valves open $51\frac{1}{2}$ degrees before lower dead center and close $4\frac{1}{2}$ degrees after top



FORD

NEW MODEL A (1930-31)

FORD GENERATING, STARTING SYSTEM

FORD IGNITION

dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Starter is connected to the engine through an inboard Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is two pounds. Starter switch is mounted on the field frame. The new type switch has a flat spring and if it is installed on an old starter the starter terminal must be dressed down flat to a height of $11/32 - \frac{3}{8}$ inch. The starter cable terminal has been redesigned and now extends straight out from the cable. The old cable assembly can be used with the new switch by bending the terminal from its right angle position.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2700	6	50
14 "	Lock	3.75	560

Mounting:—Starter is flange mounted at left of engine on forward side of fly-wheel housing. To remove starter, disconnect cable and pedal rod or remove starter switch (this is the quickest method). Then remove flange mounting cap screws and pull starter forward. Lift starter from place.

Oiling:—Starter bearings are oilless. They require no attention.

GENERATOR:—The generator has been modified and a new type two pole three brush generator is now being used. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by hand. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush is held in position by the spring tension of the third brush holder. For normal driving the charging rate should be set at 6 amperes during the summer months and 10 amperes in winter. The maximum charging rate is reached at 1500 R.P.M. or 25 M.P.H.

Generator Data		
Amperes	Volts	R.P.M.
10-14	7.0	1500

Shunt field current is 4.5 amperes at 6 volts. Generator, motoring, draws 4.75 amperes at 6 volts. Brush spring tension is 24 ounces.

Mounting:—Generator is mounted at left of engine by special bracket and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt and bracket mounting bolt. Swing generator toward engine and slip off drive belt. Then take out mounting bolt in bracket under generator and lift generator from place.

Oiling:—Put 2 or 3 drops of light engine oil in the oiler at the drive end of the generator every 1000 miles of operation. Fill the oiler on the commutator end of the generator every 2000 miles of operation. The commutator end bearing is oiled from this oil well by a wick which bears against the porous bushing of the bearing. If the generator is disassembled care must be taken to replace this wick. The wick does not extend through the bushing and the bushing should not be drilled to open this oiler as the porosity of the bushing is sufficient to provide ample lubrication.

RELAY:—Ford Model. Relay is mounted on the generator field frame. Relay contacts close when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .010 inch with contacts closed.

LIGHTING:—Ford Lighting Switch Part No. A-11654-B. Switch is mounted on the lower end of the steering column. Headlights are now 'Twolite' using 21 cp. double filament bulbs. Two types are used, Ford Part No. A-13005-C (with dimmer bulbs) and Part No. A-13005-D (for use with fender lights or cowl lights). Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110 or 6-8 volt, 32-21 cp. D.C. Mazda 'Ford' type (for use in states where laws permit). Stop light is 6-8 volt, 21 cp. S.C. Mazda 1129. Auxiliary headlights and cowl lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 2 cp. S.C.

FRANKLIN

SERIES 15 MODELS 151, 152, 153 (1931)

TRANSCONTINENTAL AND DE LUXE MODELS

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—National, Type 619-SM, 6 volt, 165 ampere hour. The positive (+) terminal is grounded. The battery is mounted under the right front seat and is grounded to the right frame member.

IGNITION:—Coil Model 532-C and Z. The ignition switch is built in the base of the coil (532-Z) used on Transcontinental models. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. The 532-C coil, used on De Luxe models, is mounted on the back of the dash but is not of the coil lock type. A separate lock ignition switch is used. Ignition current is 1.7-2 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped.

Distributor Model 642-P. Breaker contact gap should be .020 inch. Set contact gap by loosening lock screw on stationary contact mounting plate (directly behind breaker arm) and turning eccentric adjusting screw. Re-surface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine). Automatic advance begins at 400 R.P.M. of engine. Maximum automatic advance is 31 degrees reached at 2400 R.P.M. The distributor manual advance is controlled by a spark button on the instrument panel. The normal position is with distributor advanced (button pushed in toward the dash). Pulling out the button provides retard for starting and full load operation at low speeds.

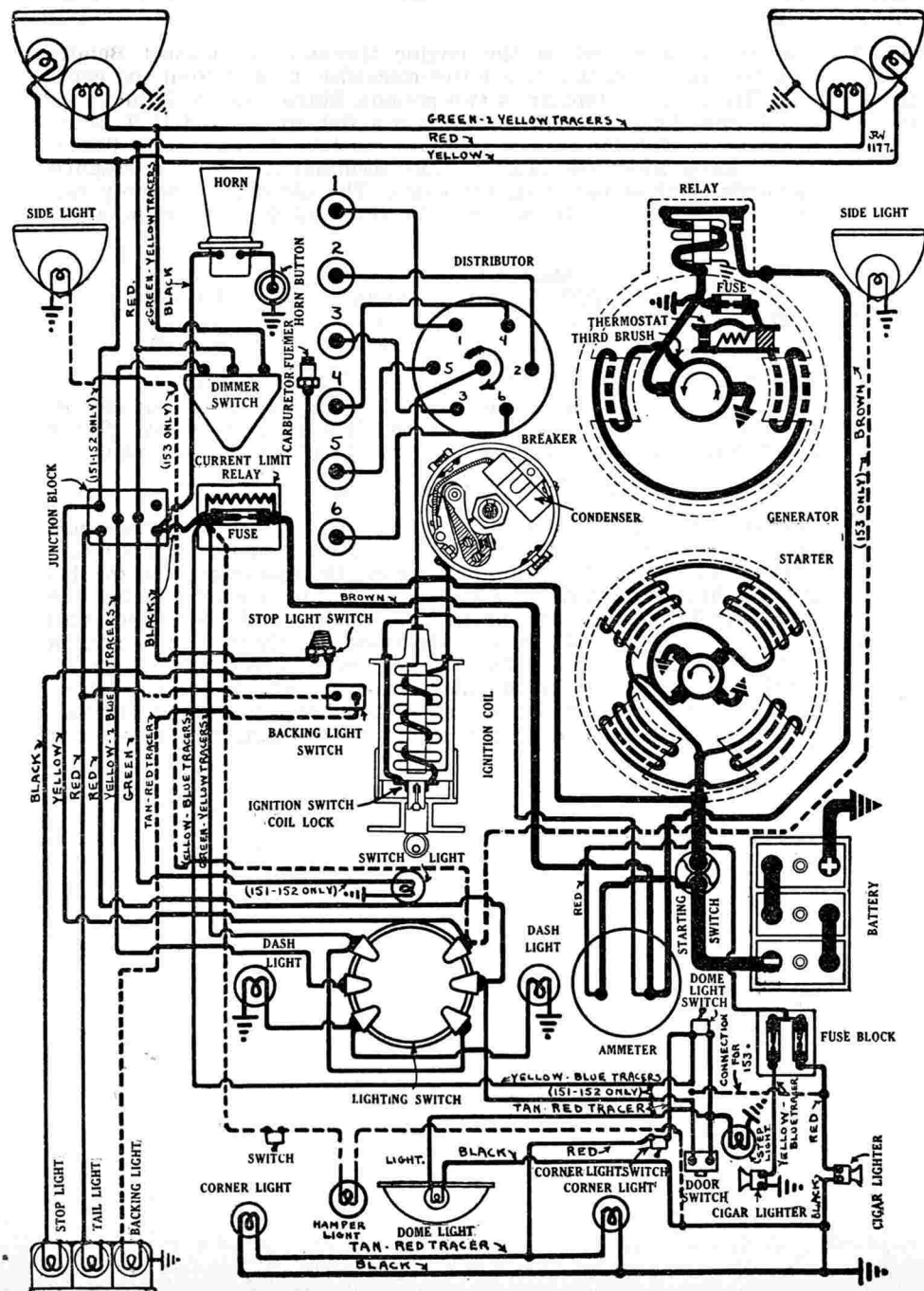
Mounting:—Distributor is mounted on the crankcase at the right of the engine. To remove distributor, disconnect the primary lead and remove the distributor cap with cables intact. Then loosen advance arm clamp bolt and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one half turn every month or each 1000 miles of operation. At the same time remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil. Put a drop of oil on the breaker arm pivot pin and place a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position one inch before top dead center (measured on the fan wheel) with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control (push the spark button all the way in toward the dash) and see that the distributor is rotated counter-clockwise as far as possible. Remove the inspection cover over the fan wheel at the front of the engine on the right side. Turn the engine over until the fan wheel mark '0', which is the top dead center mark for cylinder No. 1, is one inch before or to the right of the indicator line on the fan wheel housing. Then loosen the advance arm clamp bolt and rotate the distributor until the contacts begin to open. Tighten the clamp bolt and see that the distributor head segment which is opposite the rotor is connected to the spark plug in cylinder No. 1.

Firing Order:—The firing order is 1-4-2-6-3-5.

Spark Plugs:—Spark plugs are 18 MM. Metric. Champion No. 7. Gaps are .025 inch.



FRANKLIN

SERIES 15 MODELS 151, 152, 153 (1931)

TRANSCONTINENTAL AND DE LUXE MODELS

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

VALVE TIMING:—INLET VALVES. Head diameter, 1 27/32 inches. Stem diameter, .3725-.3715 inch. Stem length, 6.214-6.144 inches over all. Valve lift, 5/16 inch. Spring pressure, 50 pounds (valve closed), 100 pounds (valve open). Tappet clearance, .003 inch (hot). Inlet valves open 28 degrees after top dead center and close 36 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 21/32 inches. Stem diameter, .3725-.3715 inch. Stem length, 5.256-5.276 inches over all. Valve lift, 5/16 inch. Spring pressure, 50 pounds (valve closed), 100 pounds (valve open). Tappet clearance, .006 inch (hot). Exhaust valves open 52 degrees before lower dead center and close 8 degrees before top dead center. Valve stem guides are removable. Valves with oversize stems are not made. The tappet clearance must be adjusted with the engine hot and running at idling speed.

To check the valve timing, crank engine over until piston No. 1 is on top dead center entering power stroke. Set tappet clearance of No. 1 inlet valve at .036 inch and insert a .005 inch feeler gauge to be used to determine when valve closes. Turn engine over almost one complete revolution and stop when the tension on the .005 inch feeler indicates that the valve is about to open. The '0' mark on the fan wheel should be between 3 3/16 and 4 3/16 past the indicator line on the fan wheel housing. To set valve timing, assemble the camshaft sprocket on the camshaft so that the '0' mark on the sprocket lines up with the '0' on the camshaft flange. Turn the camshaft and crankshaft so that the '2' marks on the sprockets line up and assemble the timing chain.

STARTER:—Model 723-C. Starter is connected to the engine through a set of reduction gears and a Bendix drive. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Starter cranks the engine at 175 R.P.M. drawing 135 amperes at 5 volts. Brush spring tension is 24-28 ounces. Starter switch is Model 408-A.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3500	5	70
2 "	2550	5	135
22 "	Lock	3.5	620

Mounting:—Starter is flange mounted at the right of the engine on the forward face of the clutch housing. To remove the starter, disconnect the cable and fuemer lead and take out three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in each of the three starter bearing oilers every month or each 1000 miles of operation. Once each year remove the grease plug in the reduction gear case and pack gear compartment with graphite grease.

GENERATOR:—Model 957-E. Generator current regulation is by third brush shunt field and thermostat. The direction of rotation is counter-clockwise, viewed from the commutator end. The thermostat contacts open at 190°F. cutting the resistance connected across the contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the locking screw on the outside of the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting the maximum charging rate is 18 amperes at 8.6 volts reached at 1700 R.P.M. or 27 miles per hour.

Generator Data					
Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
16-8.....	8.83.....	1650	11-13.....	7.5-7.8.....	1800

A five ampere field fuse mounted under a plug on the end plate is connected in the field circuit. Shunt field current is 4 amperes at 6 volts. Generator motoring, draws 5.5 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is flange mounted at the right of the engine on the rear of the timing chain case. To remove generator, disconnect the lead and take out the two upper flange mounting cap screws. Remove the nut on the lower flange mounting stud but do not disturb the nut on the forward end of the stud. Pull generator to the rear to disengage drive coupling and lift from place. The drive sprocket is mounted on a journal between the generator flange and the chain case which permits removal of the generator without disturbing the chain or the valve timing.

Adjustment of Timing Chain. The tension of the timing chain is adjusted by shifting the generator. To take up the timing chain, loosen the two upper flange mounting screws and the nut on the forward end of the lower mounting stud. Then turn up on the adjustment set screw until there is 3/8-1/2 inch up and down play on the chain between the generator sprocket and the camshaft sprocket. This can be checked by removing the timing chain inspection plug in the top of the chain case. Then tighten the mounting screws and stud nut. With the proper adjustment the chain should run noiselessly. If the chain hums with the engine running, the adjustment is too tight and the generator must be backed off slightly.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the generator every month or each 1000 miles of operation. The drive end bearing is oiled from the chain case.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay contacts close at 680 R.P.M. or 8-9 M.P.H. when the voltage of the generator reaches 6.25 volts and open with a discharge current of 1.5 amperes. Relay contact gap is .015-.025 inch. Air gap should be .014-.020 inch with contacts closed.

LIGHTING:—Hersey Lighting Switch, Delco-Remy Dimmer Switch Model 486-J. Lighting switch is mounted on the instrument panel. Headlights are equipped with double filament bulbs controlled by a dimmer switch mounted at the lower end of the steering column. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Auxiliary headlights or side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light and backing light (when used) are each 6-8 volt, 15 cp. S.C. Mazda 87. Stop light on Models 151 and 152 is 6-8 volt, 21 cp. S.C. Mazda 1129. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Corner lights on closed cars are 6-8 volt, 3 cp. S.C. Mazda 63.

CURRENT LIMIT RELAY:—This consists of a fixed resistance connected across a 20 ampere fuse. The current limit relay is connected in the lighting circuits to protect them from overload. When the current reaches 20 amperes the fuse burns out. The resistance then limits the current flow to 30 amperes.

FUSES:—Generator field fuse is 5 ampere capacity. Lighting fuse mounted on the Current Limit Relay is 20 ampere capacity. Lighting fuses for closed car body circuits mounted on fuse block on the dash are 30 ampere capacity.

GARDNER

MODEL 136 (1931) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Prest-O-Lite, Type 615-JFK, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 120 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the right frame member under the front floor boards.

IGNITION:—Coil Model 526-W. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the switch extending through to the face of the instrument panel. Ignition current is .6-2.5 amperes at 6 volts with engine running and 4.5 amperes at 6 volts with engine stopped.

Distributor Model 640-L. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock nut on stationary contact mounting plate (located directly behind contacts) and turning eccentric adjusting screw until gap is .022 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine). Automatic advance begins at 500 R.P.M. of engine. Maximum automatic advance is 17.5 degrees (engine) reached at 2000 R.P.M.

Mounting:—Distributor is mounted in well on top of cylinder head. To remove distributor, disconnect manual advance control and primary lead and remove distributor head with cables intact. Then take out manual advance stop screw and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down one full turn every two weeks or each 500 miles of operation. Every 5000 miles remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

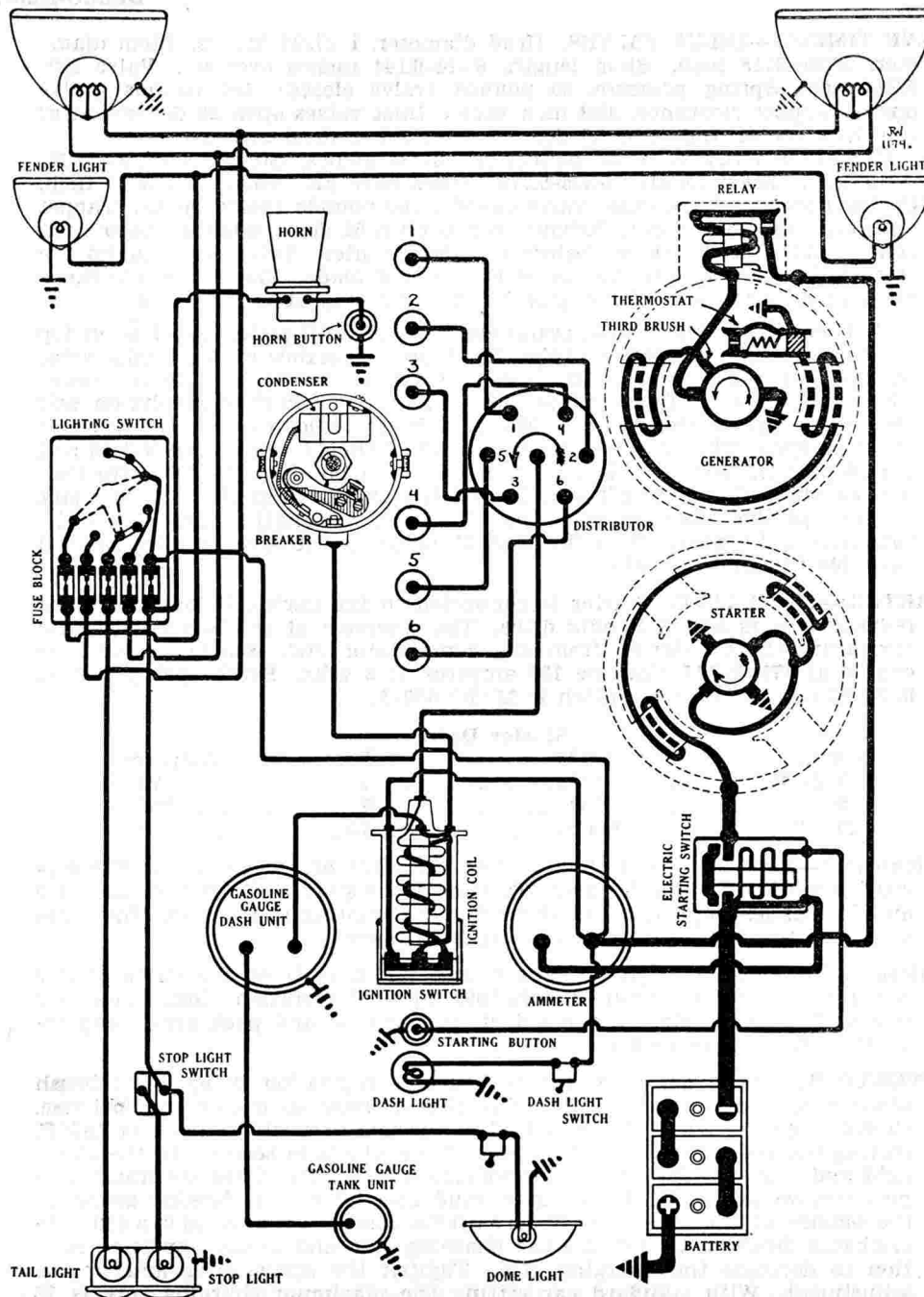
Timing:—Breaker contacts begin to separate when the piston entering power stroke reaches a position 8 degrees (on the flywheel) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until No. 1 piston enters compression stroke (the up stroke with both valves closed). Fully advance manual spark control. Turn engine over until a point on the flywheel 8 degrees or two teeth before the top dead center mark is directly opposite the indicator on the flywheel housing. Then loosen advance arm clamp screw and rotate distributor until the contacts begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Standard. Gaps are .030 inch.

VALVE TIMING:—INLET VALVES:—Head diameter, 1 $\frac{17}{32}$ inches. Stem diameter, .341-.3425 inch. Stem length, $\frac{5}{8}$ inches. Valve lift, $\frac{11}{32}$ inch. Spring pressure, 44 pounds (valve closed). Tappet clearance, .006 inch (hot). Inlet valves open 5 degrees before top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, 1 $\frac{13}{32}$ inches. Stem diameter, .341-.3425 inch. Stem length, $\frac{5}{8}$ inches. Valve lift, $\frac{11}{32}$ inch. Spring pressure, 44 pounds (valve closed). Tappet clearance, .008 inch (hot). Exhaust valves open 50 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are made for replacement.



GARDNER

MODEL 136 (1931) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

STARTER:—Model 716-A. Starter is connected to the engine through reduction gears and a Bendix drive. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Brush spring tension is 24-28 ounces. The starting switch is an electro-magnetic unit mounted on the starter field frame. It is controlled by a button on the instrument board.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5	70
15 "	Lock	3.7	450

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting switch leads. Then remove three flange mounting cap screws. Pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles of operation. The drive end bearing is oilless. Repack gears with graphite grease every six months.

GENERATOR:—Model 955-H. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round headed screw on the generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting the maximum charging rate is 19 amperes (cold) reached at 1450 R.P.M. or 30 miles per hour.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.5	1450	9-12	7.5	2000

Shunt field current is 5 amperes at 6 volts. Generator motoring draws

5.5 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is flange mounted at right of engine by special swinging bracket and is belt driven from the crankshaft. The water pump is mounted on the rear of the generator and is driven by an extension of the generator shaft. To remove generator, first drain radiator and remove water pump hose connections. Then remove adjustment clamp bolt and swing generator toward the engine. Slip off drive belt. Take out the two bolts holding generator on the mounting bracket and lift generator and water pump assembly from place. The water pump can then be removed from the generator by taking out the two mounting screws.

Belt Adjustment. The driving belt tension is adjusted by shifting the generator. To take up driving belt, loosen the adjustment clamp bolt and swing generator out away from the engine until the proper belt tension is secured. Tighten the clamp bolt. The belt should be tight enough to drive the generator and pump without slipping. Any excessive belt tension will cause wear in the generator bearings.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 6-7 M.P.H. when the generator voltage reaches 6.75 volts and open with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 420-Q. Lighting switch is mounted at lower end of steering column and is controlled by a lever on the steering wheel. Double filament headlight bulbs using a second 21 cp. filament instead of dimmers are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights (in headlights) are 6-8 volt, 3 cp. S.C. Mazda 63. Side lights (when used) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 3 cp. D.C. Mazda 64.

FUSES:—Five lighting fuses are mounted on a fuse block on the switch. They are 10 ampere capacity.

GARDNER

MODEL 148 (1931)
PRODUCTION STARTED JULY 1, 1929
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

BATTERY:—Prest-O-Lite, Type 615-JFK, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 120 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the right frame member under the front floor boards.

IGNITION:—Coil Model 526-W. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the switch extending through to the face of the instrument panel. Ignition current is .6-2.5 amperes at 6 volts with engine running and 4.5 amperes at 6 volts with engine stopped.

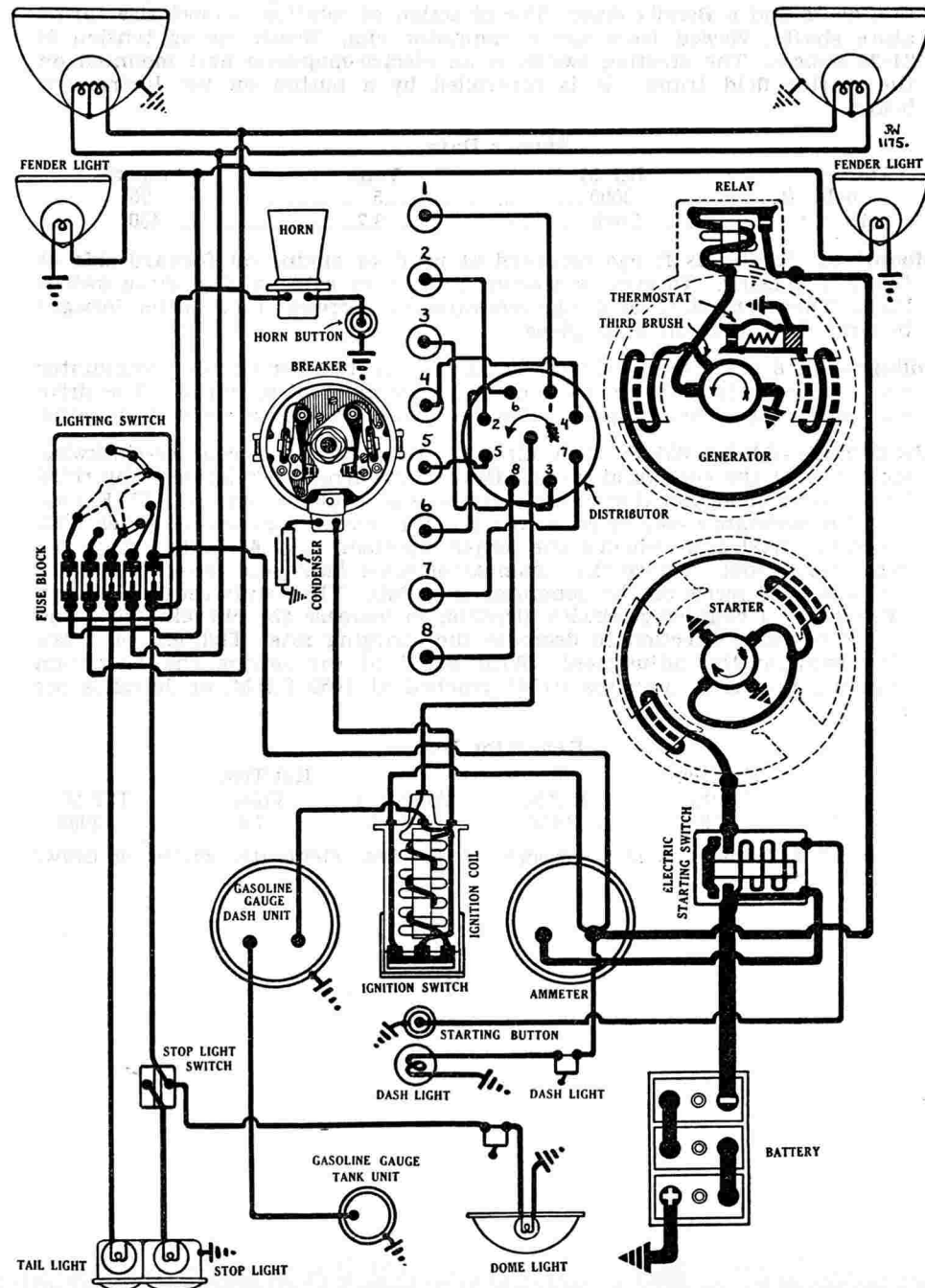
Distributor Model 658-B. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw until gap is .022 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. There are two sets of breaker contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set for satisfactory engine performance by synchronizing contacts. See Timing. Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine). Automatic advance begins at 500 R.P.M. of engine. Maximum automatic advance is 17.5 degrees (engine) reached at 2000 R.P.M.

Mounting:—Distributor is mounted in well on top of cylinder head. To remove distributor, disconnect manual advance control and primary lead and remove distributor head with cables intact. Then take out manual advance stop screw and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down one full turn every two weeks or each 500 miles of operation. Every 5000 miles remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Use Delco-Remy special tool, Part No. 820738, and follow directions in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over exactly 90 degrees when piston No. 6 will reach firing position (6 degrees or 1½ teeth on the flywheel before top dead center). Loosen two lock screws on breaker sub-plate and shift plate by turning eccentric adjusting screw until the second set of contacts begin to open. Tighten the lock screws and check the contact gap with the breaker arm on the lobe of the cam. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches a position 6 degrees or 1½ teeth on the flywheel before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance spark control lever. Turn engine over until a point on the flywheel 6 degrees or 1½ teeth before the top dead center point is directly opposite the indicator on the flywheel case. Then loosen advance arm clamp screw and rotate distributor until one set of contacts begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1.



GARDNER

MODEL 148 (1931)

PRODUCTION STARTED JULY 1, 1929
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Standard. Gaps are .030 inch.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1 $\frac{17}{32}$ inches. Stem diameter, .341-.3425 inch. Stem length, $5\frac{1}{4}$ inches. Valve lift, $1\frac{1}{32}$ inch. Spring pressure, 44 pounds (valve closed). Tappet clearance, .006 inch (hot). Inlet valves open at top dead center and close 45 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, 1 $\frac{13}{32}$ inches. Stem diameter, .341-.3425 inch. Stem length, $5\frac{1}{4}$ inches. Valve lift, $1\frac{1}{32}$ inch. Spring pressure, 44 pounds (valve closed). Tappet clearance, .008 inch (hot). Exhaust valves open 50 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are made for replacement.

STARTER:—Model 716-A. Starter is connected to the engine through a set of reduction gears and a Bendix drive. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Brush spring tension is 24-28 ounces. The starting switch is an electro-magnetic unit mounted on the starter field frame. It is controlled by a button on the dash.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	5	70
15 "	Lock	3.7	450

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting switch leads. Then remove three flange mounting cap screws. Pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end bearing is oilless. Every six months repack gear compartment with graphite grease.

GENERATOR:—Model 955-H. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round headed screw on the generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting the maximum charging rate is 19 amperes (cold) reached at 1450 R.P.M. or 30 miles per hour.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.5	1450	9-12	7.5	2000

Shunt field current is 5 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is flange mounted at right of engine by special swinging bracket and is belt driven from the crankshaft. The water pump is mounted on the rear of the generator and is driven by an extension of the generator shaft. To remove generator, first drain radiator and remove water pump hose connections. Then remove adjustment clamp bolt and swing generator toward the engine. Slip off drive belt. Take out the two bolts holding generator on the mounting bracket and lift generator and water pump assembly from place. The water pump can then be removed from the generator by taking out the two mounting screws.

Belt Adjustment. The driving belt tension is adjusted by shifting the generator. To take up driving belt, loosen the adjustment clamp bolt and swing generator out away from the engine until the proper belt tension is secured. Tighten the clamp bolt. The belt should be tight enough to drive the generator and pump without slipping. Any excessive belt tension will cause wear in the generator bearings.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 6-7 M.P.H. when the generator voltage reaches 6.75 volts and open with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 420-Q. Lighting switch is mounted at lower end of steering column and is controlled by a lever on the steering wheel. Double filament headlight bulbs using a second 21 cp. filament instead of dimmers are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights (in headlights) are 6-8 volt, 3 cp. S.C. Mazda 63. Side lights (when used) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 3 cp. D.C. Mazda 64.

FUSES:—Five lighting fuses are mounted on a fuse block on the switch. They are 10 ampere capacity.

GARDNER

MODEL 158 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

BATTERY:—Prest-O-Lite, Type 617-RHK, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 152 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 27 hours. Battery is mounted on right frame member under the front floor boards.

IGNITION:—Coil Model 526-W. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument panel with the switch extending through to the face of the instrument panel. Ignition current is .6-2.5 amperes at 6 volts with engine running and 4.5 amperes at 6 volts with engine stopped.

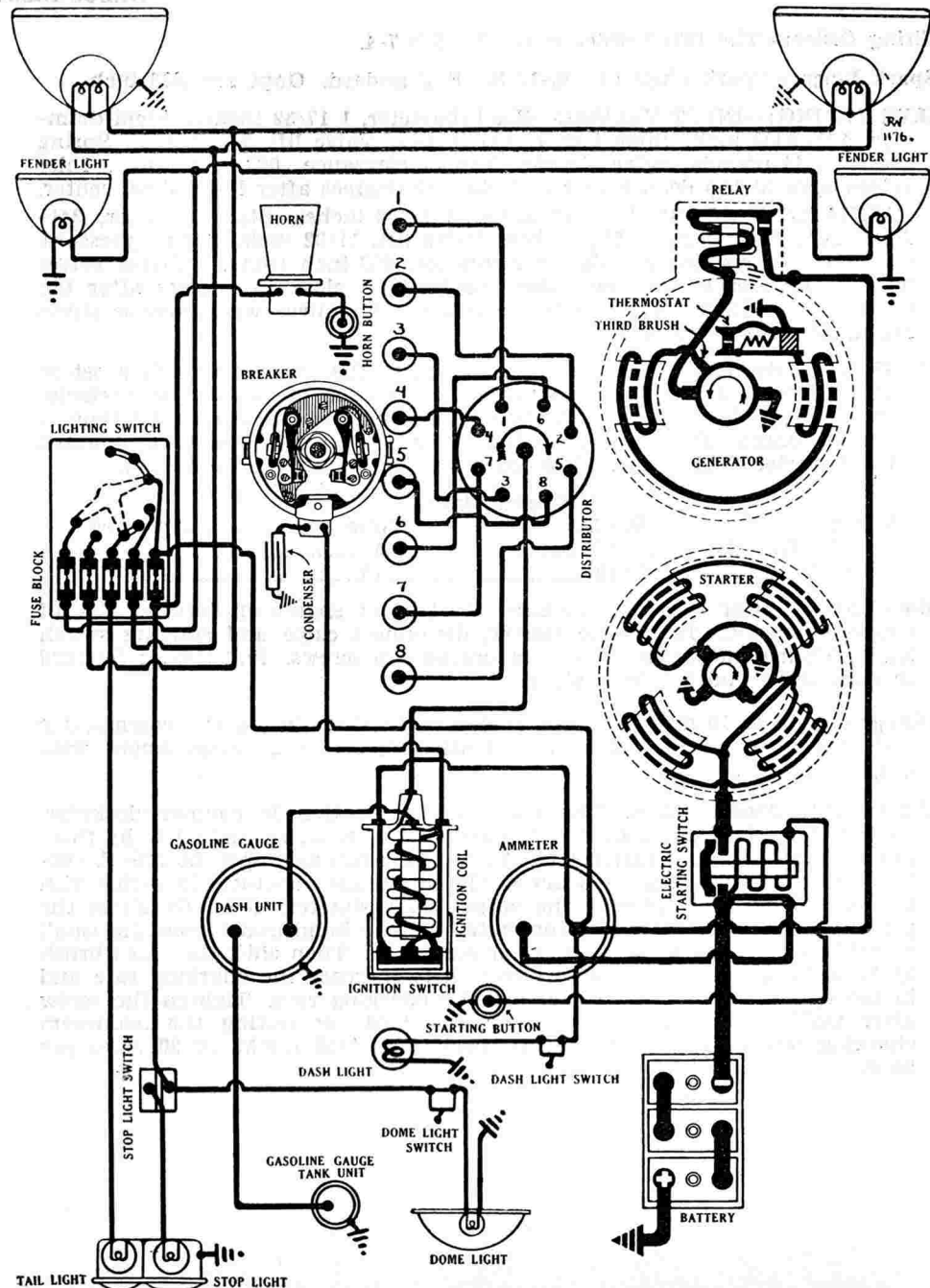
Distributor Model 658-R. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw until breaker gap is .022 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. There are two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degrees firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing. Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine). Automatic advance begins at 500 R.P.M. of engine. Maximum automatic advance is 17.5 degrees reached at 2000 R.P.M.

Mounting:—Distributor is mounted in well on top of cylinder head. To remove distributor, disconnect manual advance control and primary lead and remove distributor head with cables intact. Then take out manual advance stop screw and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down one full turn every two weeks or each 500 miles of operation. Every 5000 miles remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Use special Delco-Remy tool, Part No. 820738, and follow directions given in Equipment Section. Contacts can be synchronized without use of special equipment after distributor has been timed to the engine by cranking engine over exactly 90 degrees when piston No. 6 will reach firing position (6 degrees or 2 teeth on the flywheel before top dead center). If the second set of contacts mounted on the movable sub-plate do not open at this point, loosen the two lock screws and turn the eccentric adjusting screw until contacts open. Tighten the lock screws and check the contact gap with the breaker arm on the lobe of the cam. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position 6 degrees or two teeth on the flywheel before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the spark control lever. Turn engine over until a point on the flywheel 6 degrees or two teeth before the top dead center point is exactly opposite the indicator on the flywheel housing. Then loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs as indicated on the wiring diagram.



GARDNER

MODEL 158 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 7/8-18 S.A.E. Standard. Gaps are .030 inch.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1 1/8 inches. Stem diameter, 11/32 inch. Stem length, 4 7/8 inches. Valve lift, 5/16 inch. Spring pressure, 36 pounds (valve closed). Tappet clearance, .006 inch (hot). Inlet valves open at top dead center and close 45 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, 1 15/32 inches. Stem diameter, 11/32 inch. Stem length, 4 7/8 inches. Valve lift, 5/16 inch. Spring pressure, 36 pounds (valve closed). Tappet clearance, .008 inch (hot). Exhaust valves open 50 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are made for replacement.

STARTER:—**Model 720-Y.** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starting switch is an electro-magnetic unit mounted on the starter field frame. It is controlled by a button on the instrument board.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5.0	65
15 "	Lock	3.15	570

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting switch leads and take out three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the starter every month or each 1000 miles of operation.

GENERATOR:—**Model 955-K.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the end plate. Then shift the third brush in a

counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting the maximum charging rate is 19 amperes (cold) reached at 1450 R.P.M. or 30 M.P.H.

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.5	1450	9-12	7.5	2000

Shunt field current is 5 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is flange mounted at right of engine on rear of timing chain case. To remove generator, first drain radiator and take off hose connections to water pump (mounted on the rear of the generator). Then loosen plate on front of chain case and swing out of the way. Loosen generator flange mounting nuts, push generator toward motor and lift drive chain off generator sprocket. Tie up the chain to prevent it slipping off camshaft sprocket. Take out the flange mounting nuts. Pull generator to the rear to clear drive sprocket and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the generator oiler every month or each 1000 miles.

RELAY:—**Model 265-B.** Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 6-7 M.P.H. when the generator voltage reaches 6.75 volts and open with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—**Model 420-Q.** Lighting switch is mounted at the lower end of the steering column and is controlled by a lever on the steering wheel. Double filament headlight bulbs using the second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights in headlights are 6-8 volt, 3 cp. S.C. Mazda 63. Side lights (when used) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 3 cp. D.C. Mazda 64.

FUSES:—There are five lighting fuses mounted on a fuse block on the lighting switch. They are 10 ampere capacity.

GRAHAM

STANDARD SIX SERIES 53 (1931) SPECIAL SIX SERIES 54 (1931) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-2-15. 6 volt, 100 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 105 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the right frame member under the right front seat.

IGNITION:—Coil Model 528-C. Coil is mounted on the rear of the dash. Ignition current is 1.8 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' coincidental steering post and ignition switch lock.

Distributor Model 632-F. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock nut on crescent shaped stationary contact mounting plate and turning eccentric adjusting screw until gap is .020 inch with breaker arm on lobe of cam. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. It is designed to operate under normal conditions in the full manual advance position with the spark control button pushed all way in toward the dash. Pulling out the button provides an auxiliary retard for starting. Maximum manual advance is 15 degrees (distributor). Automatic advance begins at 400 R.P.M. of engine. Maximum automatic advance is 18 degrees reached at 2800 R.P.M. of the engine.

Mounting:—Distributor is mounted on the cylinder head. It may be removed from the left side. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then loosen advance arm clamp screw and lift distributor from place. The distributor may be removed without disturbing timing providing the advance arm is left in place. The manual advance control wire and hold-down screw should be disconnected and the distributor can then be lifted out. Distributor drive is through an offset tongue and slot coupling. In mounting distributor, make certain that the tongue enters the slot properly.

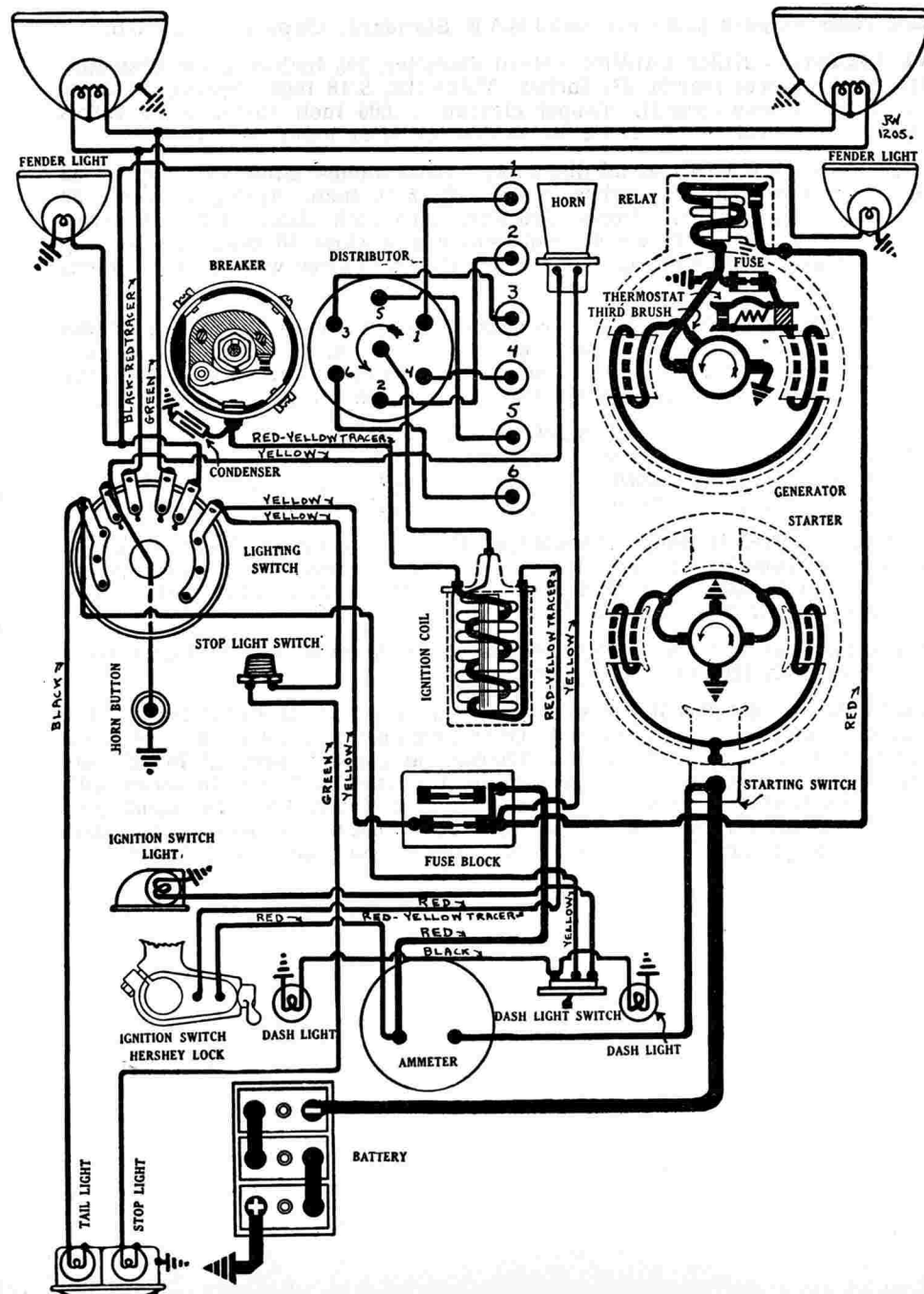
Oiling:—Fill the grease cup on the side of the shaft with medium cup grease and turn down one full turn every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and rotor and saturate the wick in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position 1 degree (on the flywheel) before top dead center with the spark control button in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Place the spark control button in the fully advanced position (pushed all the way in toward the dash). Continue to crank engine over until the flywheel mark 'SFADV-1' which is 1 degree before the top dead center mark 'Top DC 1&6' is directly opposite the indicator on the flywheel housing. Loosen advance arm clamp screw and rotate distributor in a clockwise direction until the contacts begin to open. Tighten the clamp screw and check position of rotor to see that it is directly opposite segment connected to the spark plug in cylinder No. 1.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 7/8-18 S.A.E. (own design). Gaps are .025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1.562 inches. Stem diameter, .340 inch. Stem length, 5.5 inches. Valve lift, .3145 inch. Spring pressure, 50 pounds (valve closed), 94 pounds (valve open). Tappet clearance, .010



GRAHAM

STANDARD SIX SERIES 53 (1931) SPECIAL SIX SERIES 54 (1931) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

inch (hot). Inlet valves open at top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1.469 inches. Stem diameter, .340 inch. Stem length, 5.5 inches. Valve lift, .3195 inch. Spring pressure, 50 pounds (valve closed), 94 pounds (valve open). Tappet clearance, .010 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made. The flywheel is marked 'DC.1-6' at point of inlet opening for cylinder No. 1.

STARTER:—Model 714-V. Starter is connected to the engine through a manual pinion shift interconnected with the starting switch pedal. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter cranks the engine at 120 R.P.M. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5	65
12 "	Lock	3.63	475

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and remove nuts on three flange mounting studs. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every two weeks or each 500 miles of operation. The drive end bearing is oilless.

GENERATOR:—Model 957-B. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charg-

ing rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting, the maximum charging rate is 10.8 amperes (hot) at 7.5 volts reached at 1800 R.P.M. or 32 M.P.H.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.5	1300	10-12	7.5	1800-2000

There is a 6 ampere field fuse mounted under the fuse plug on the end plate. Generator brush spring tension is 16-18 ounces. Shunt field current is 4-6.1 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts.

Mounting:—Generator is cradle mounted at right of engine and is driven through a flexible hose coupling from an extension of the water pump shaft. To remove generator, disconnect lead and loosen mounting band. Disconnect hose coupling and slide generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay closes at 700 R.P.M. or 12 M.P.H. when the generator voltage reaches 7-7.4 volts and opens with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Briggs & Stratton Switch Model 50239. Lighting switch is mounted at lower end of steering column. Double filament headlight bulbs using a second 21 cp. filament instead of dimmers are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 6 cp. S.C. Mazda 81.

FUSES:—Generator field fuse is 6 ampere capacity. Lighting fuse mounted on fuse block on the dash is 20 ampere capacity.



GRAHAM

SPECIAL EIGHT SERIES 49 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-2-15. 6 volt, 100 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 105 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the right frame member under the right front seat.

IGNITION:—Coil Model 528-C. Coil is mounted on the rear of the dash. Ignition current is 1.4 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' co-incidental steering post and ignition switch lock.

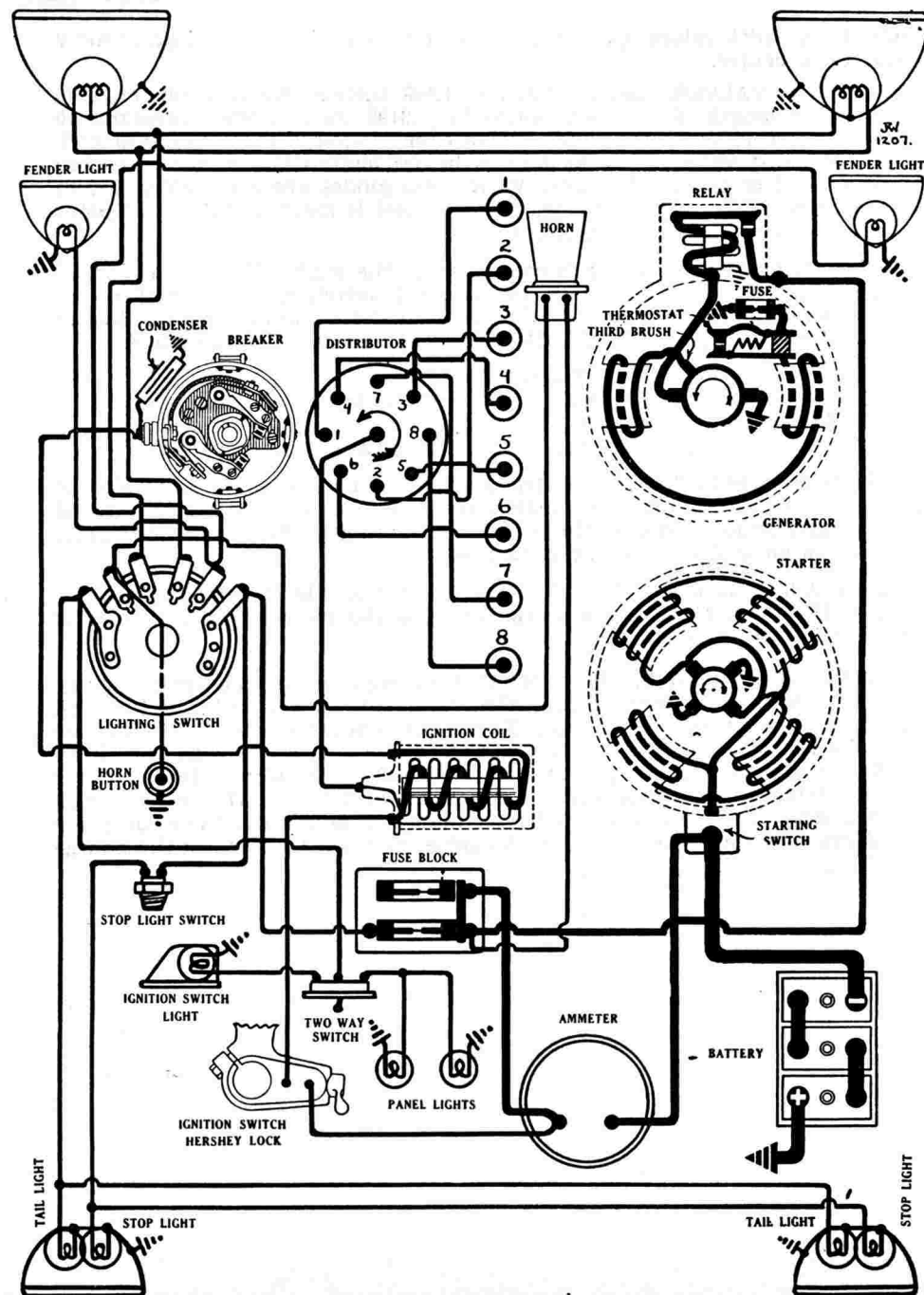
Distributor Model 660-C. Breaker contacts separate .020 inch. Set contact gap by loosening lock screw on stationary contact mounting plate directly behind contacts and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. It is designed to operate under all normal conditions in the fully advanced position with the spark control button pushed all the way in toward the dash. Pulling out the spark control button provides an auxiliary retard for starting. Maximum manual advance is 15 degrees (distributor). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 16 degrees reached at 2600 R.P.M. of engine. The distributor has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized for correct performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head and can be removed from the left side. To remove distributor, disconnect the primary lead and remove the distributor head with the cables intact. Then loosen advance arm clamp screw and lift distributor from place. The distributor can be removed without disturbing the timing if the advance arm is left clamped to the distributor and the spark control wire and hold-down screw are taken out. Distributor is driven through an offset tongue and slot coupling. The tongue and slot can only be assembled in the correct position.

Oiling:—Fill the grease cup on the side of the shaft with medium cup grease and turn down one full turn every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

Timing:—**Synchronization of Contacts.** Contacts must be synchronized so that the set mounted on the movable sub-assembly within the distributor housing begin to open at a point exactly 45 degrees (distributor) after the first set for satisfactory ignition performance. To synchronize contacts, use special Delco-Remy tool, Part No. 1838182, and follow directions in the Equipment Section. The contacts can be synchronized without special equipment after the distributor has been timed to the engine by cranking the engine over 90 degrees until piston No. 6 reaches firing position when the flywheel mark "SFADV-6" will be opposite the indicator. If the second set of contacts do not begin to open at this point, loosen the two locking screws on the base plate and turn the eccentric adjusting screw until the contacts open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .020 inch and repeat synchronization.

Timing Distributor to Engine. The breaker contacts begin to open when the piston entering power stroke reaches a position 5 degrees (on the flywheel) with the manual spark control button in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression.



GRAHAM

SPECIAL EIGHT SERIES 49 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

sion stroke (the up stroke with both valves open). See that spark control button is pushed all the way in toward the dash. Continue to crank engine until flywheel mark 'SFADV-1' is directly opposite the indicator in the flywheel housing on the left front side of the engine. Loosen advance arm clamp screw and rotate distributor until the contacts mounted directly on the breaker base plate begin to open. Tighten the clamp screw and check to see that rotor is directly opposite the segment connected to the spark plug in cylinder No. 1. The contacts can now be synchronized if this operation has not been completed.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. (own design). Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 $\frac{9}{16}$ inches. Stem diameter, .300 inch. Stem length, 4.891 inches. Valve lift, .218 inch. Spring pressure, 50 pounds (valve closed), 94 pounds (valve open). Tappet clearance, .010 inch (hot). Inlet valves open at top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1.312 inches. Stem diameter, .300 inch. Stem length, 4.891 inches. Valve lift, .327 inch. Spring pressure, 50 pounds (valve closed), 94 pounds (valve open). Tappet clearance, .010 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made. The inlet opening point for cylinder No. 1 is indicated on the flywheel by the mark 'DC.1-8'.

STARTER:—**Model 725-M.** Starter is connected to the engine through a manual pinion shift interconnected with the starting switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter cranks the engine at 100 R.P.M. drawing 250 amperes at 4.75 volts. Starter brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5200	5.6	60
3.6 "	1368	4.9	218
15.5 "	Lock	3.2	570

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and remove nuts on three flange mounting studs. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every two weeks or each 1000 miles of operation. The

drive end bearing is oilless.

GENERATOR:—**Model 957-B.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed lock screw on the outside of the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 12 amperes (hot) at 7.7 volts reached at 1600 R.P.M. or 34 M.P.H.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.5	1300	10-12	7.5	1800-2000

Shunt field current is 4-6.1 amperes at 6 volts. There is a six ampere field fuse mounted on the end plate which is connected in the field circuit. Brush spring tension is 16-18 ounces. Generator motoring draws 5.5 amperes at 6 volts.

Mounting:—Generator is cradle mounted at the right of the engine and is driven through a flexible hose coupling from an extension of the water pump shaft. To remove generator, disconnect lead and drive coupling and loosen mounting clamp band. Then slide generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

RELAY:—**Model 265-B.** Relay is mounted on the generator. Relay closes at 550 R.P.M. when the voltage of the generator reaches 7-7.4 volts and opens with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—**Briggs & Stratton Switch Model 50239.** Lighting switch is mounted at lower end of steering column. Double filament headlight bulbs using a second 21 cp. filament instead of dimmers are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop lights are 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 6 cp. S.C. Mazda 81.

FUSES:—Generator field fuse is 6 ampere capacity. Lighting fuse mounted on fuse block on dash is 20 ampere capacity.

GRAHAM

CUSTOM EIGHT MODEL (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-2-15, 6 volt, 100 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 105 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the right frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 528-C (2 used). Coils are mounted on the dash. Ignition current is 3.6 amperes at 6 volts with engine running and 8 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' type co-incidental steering post and ignition switch lock.

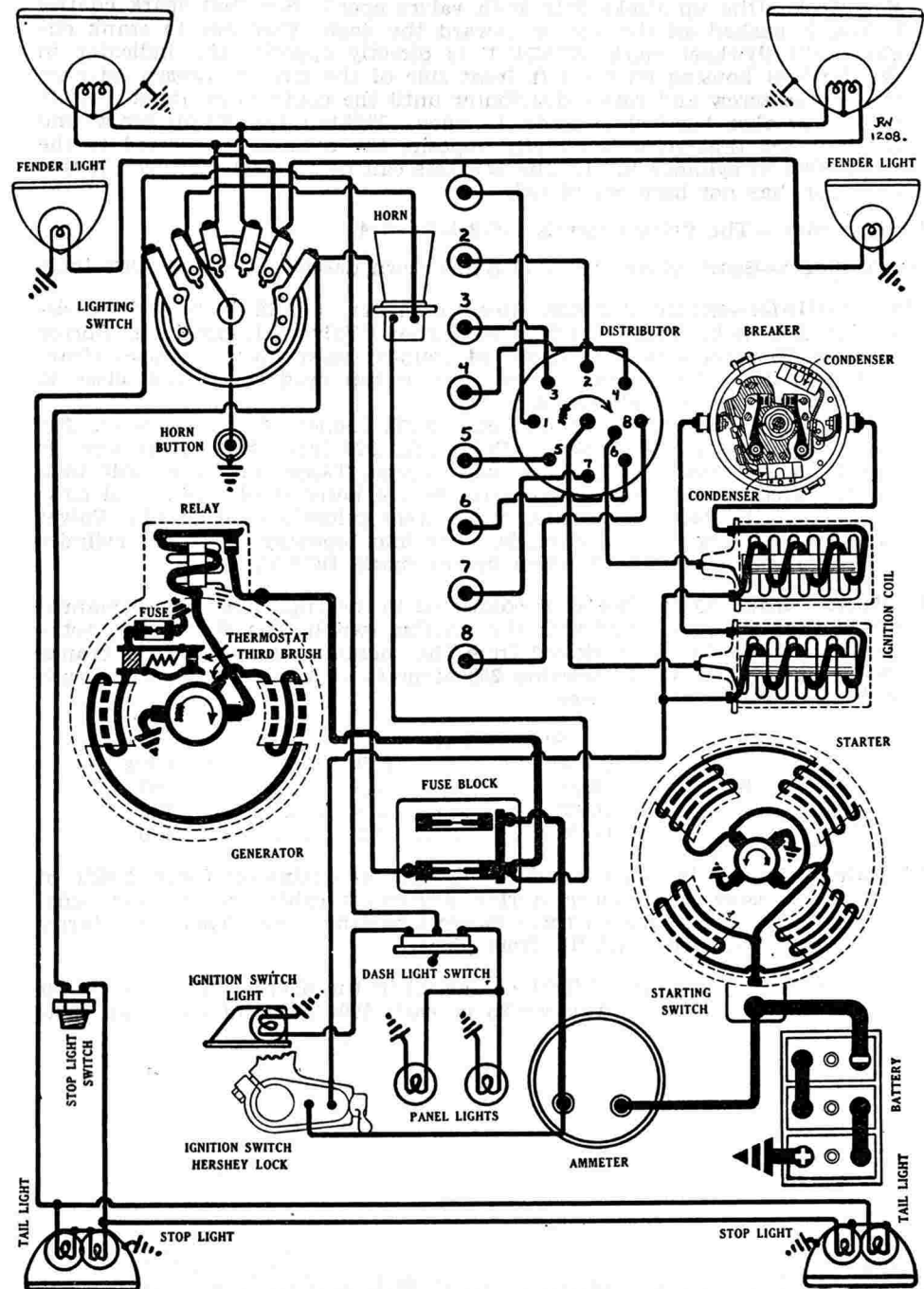
Distributor Model 668-J. Breaker contacts separate .018 inch. Set contact gap by loosening lock screw on stationary contact mounting plate directly behind contacts and turning up eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine). Automatic advance begins at 400 R.P.M. of engine. Maximum automatic advance is 22 degrees reached at 2600 R.P.M. Breaker has two sets of contacts operating on a four sided cam. Each set of contact controls one coil and fires the spark plugs in four cylinders. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized for satisfactory ignition performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head and can be removed from the right side. To remove distributor, disconnect primary leads and spark control and remove distributor head with cables intact. Then loosen advance arm clamp screw and lift distributor from place. The distributor can be removed without disturbing the timing by leaving the advance arm clamped to the distributor and taking out the hold-down screw in the advance arm. Distributor is driven through an offset tongue and slot coupling.

Oiling:—Fill the grease cup on the side of the distributor shaft and turn down two full turns every 2500 miles. At the same time remove the distributor head and rotor and put 8 or 10 drops of light engine oil in the wick oiler in the center of the shaft and put a small bit of vaseline on the face of the breaker cam.

Timing:—**Synchronization of Contacts.** Contacts must be synchronized so that the set mounted on the movable sub-base open exactly 45 degrees after the first set, which is mounted directly on the breaker base plate. To synchronize contacts use special Delco-Remy tool, Part No. 1835009, and follow complete directions in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to engine by cranking engine over exactly 90 degrees from firing position of piston No. 1 when piston No. 6 will reach firing position (5 degrees before top dead center with flywheel mark 'SFADV-6' at the indicator). If the second set of contacts do not open at this point, loosen the two lock screws on the mounting sub-base and turn the eccentric adjusting screw until they both begin to open. Tighten the lock screws and check the contact gap with the breaker arm on the lobe of the cam. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches a position 5 degrees on the flywheel before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until No. 1 piston



GRAHAM

CUSTOM EIGHT MODEL (1931)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

enters compression stroke (the up stroke with both valves closed). Fully advance spark control and take off cover plate in flywheel inspection opening. Then crank engine over until the ignition mark 'SFADV-1' on the flywheel is directly opposite the indicator on the housing. Loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted directly on the base plate) begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment in the distributor head connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs as shown on the diagram.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 7/8-18 S.A.E. (own design). Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 9/16 inches. Stem diameter, .340 inch. Spring pressure, 50 pounds (valve closed). Tappet clearance, .010 inch (hot). Inlet valves open at top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 15/32 inches. Stem diameter, .340 inch. Spring pressure, 50 pounds (valve closed). Tappet clearance, .010 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model 725-G and J. Starter is connected to the engine through a manual pinion shift interconnected with the starting switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	60
16 "	Lock	3	600

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and remove three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every 500 miles. The drive end bearing is oilless.

GENERATOR:—Model 957-C. The direction of rotation is clockwise, viewed

from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the commutator end plate. Then shift the third brush by hand in a clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting, the maximum charging rate is 22 amperes at 8.5 volts reached at 1600 R.P.M. of generator or 26 M.P.H.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.5	1300	10-12	7.75	1500

Shunt field current is 5 amperes at 6 volts. Brush spring tension is 14-18 ounces. Generator motoring draws 5.5 amperes at 6 volts. There is a 6 ampere field fuse mounted on the end plate.

Mounting:—Generator is cradle mounted at the left of the engine and is driven by an extension of the water pump shaft. To remove generator, disconnect lead and drive coupling. Loosen mounting clamp band. Lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in each of the generator bearing oilers every 500 miles.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay contacts close at approximately 550 R.P.M. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contacts separate .015-.025 inch. Air gap is .014 inch with contacts closed.

LIGHTING:—Briggs & Stratton Switch Model 50239. Lighting switch is mounted at the lower end of the steering column. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop lights are 6-8 volt, 15 cp. S.C. Mazda 87.

FUSES:—Generator field fuse is 6 ampere capacity. Lighting fuse mounted on fuse block on the dash is 20 ampere capacity. A spare fuse is mounted on the fuse block.

AUTO-LITE IGNITION

BATTERY:—Exide, Type 3-XI-13-1G. 6 volt, 105 ampere hour. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 17 hours. Battery is mounted under the left front seat.

IGNITION:—Coil Model CE-4015. Coil is mounted on the front of the engine block. Ignition current is 2 amperes at 6 volts with engine running and 5 amperes at 6 volts with engine stopped. The ignition switch is a Model 9-B Electrolock.

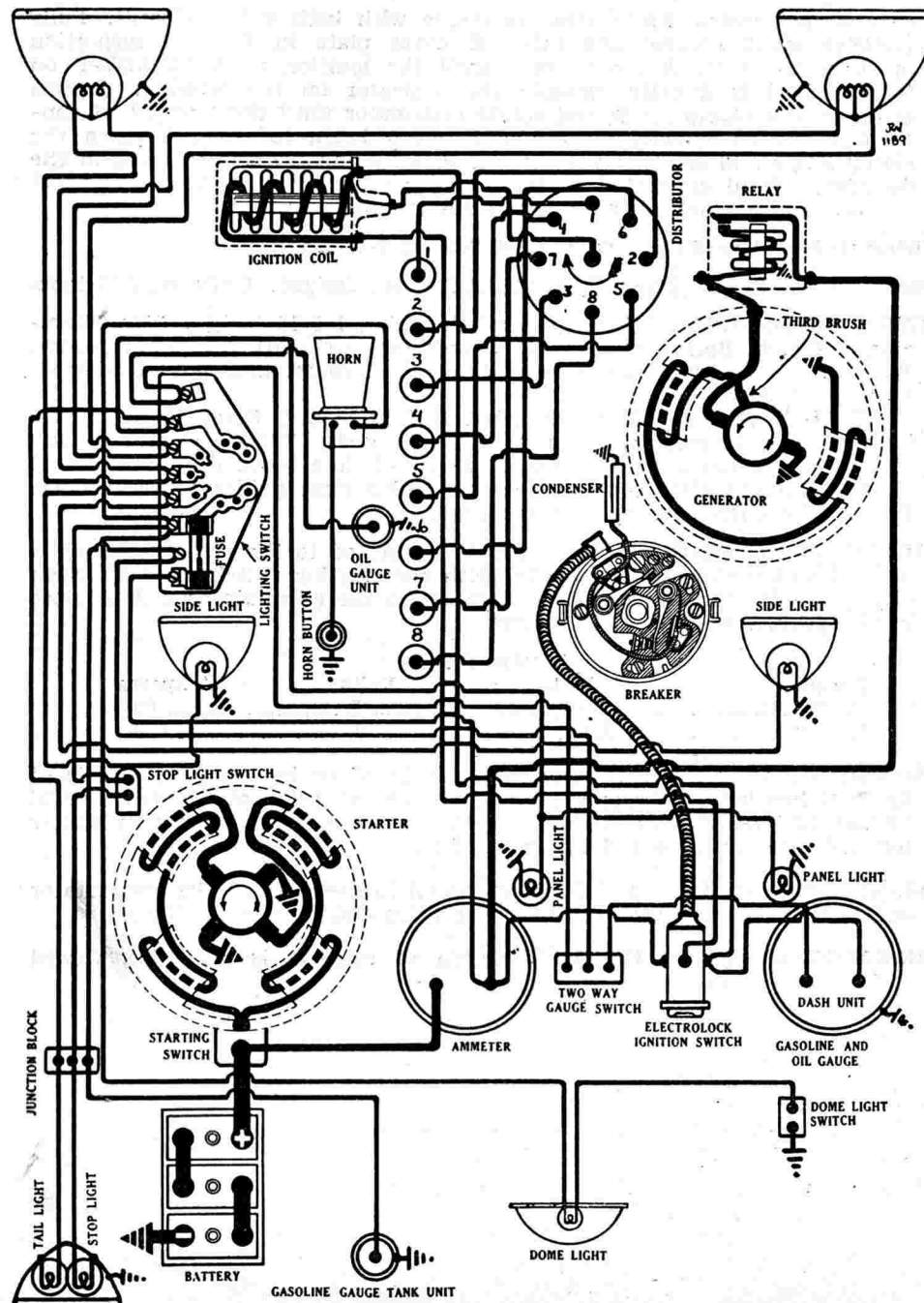
Distributor Model IGH-4009-A. Breaker contacts separate .020 inch. Set contact gap (first set mounted on stationary base plate) by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. The second set of contacts (mounted on movable sub-plate) are adjusted by loosening lock nut on stationary contact mounting stud and turning up stud to secure correct adjustment. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is full automatic. Maximum automatic advance is 10 degrees. There are two sets of contacts on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. The contacts must be synchronized for correct ignition performance. See Timing.

Mounting:—Distributor is mounted on the accessory drive bracket at the right of the engine. An Electrolock is used. This must be removed with the distributor as a unit. To remove distributor, first loosen Electrolock from dash mounting. Take off primary lead and remove distributor head with cables intact. Then remove hold-down screw in advance arm and lift distributor from place. See full directions in Equipment Section on removing Electrolock from distributor.

Oiling:—Fill the oiler on the side of the distributor shaft with light engine oil every 2000 miles. At the same time remove the distributor cap and rotor and put a few drops of oil on each of the breaker arm pivot pins and coat the face of the breaker cam with a light film of vaseline or light cup grease.

Timing:—Synchronization of Contacts. Full directions on synchronization of contacts will be found in Equipment Section listed under 'Auto-Lite Distributors.' The contacts can be synchronized without special equipment after the distributor has been timed to the engine by cranking the engine over 90 degrees from firing position of piston No. 1 when piston No. 6 will reach firing position and the flywheel mark 'DC 3&6' will be opposite the indicator in the inspection hole in the flywheel case. If the second set of contacts do not begin to open at this point, loosen the two lock screws on the movable sub-plate and shift the plate until the contacts begin to open. Tighten the lock screws and check the contact gap. It must be within limits of .018-.020 inch with breaker arm on lobe of cam.

Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches top dead center with the breaker assembly fully retarded. To set timing, crank engine over until piston No. 1 enters compression stroke. This can be checked by noting valve tappet positions (both valves should be closed) or by removing the spark plug in cylinder No. 1 and cranking engine over until compression is felt when a finger is placed over the spark plug port. Loosen hold-down screw in advance arm and rotate distributor clockwise as far as possible. Then continue to crank engine over until flywheel mark 'DC 1&8' is in line with the



HUDSON

GREATER EIGHT (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

indicator in the inspection hole in the front face of the flywheel housing on the right side of the engine. Then loosen advance arm clamp bolt and rotate distributor housing until the set of contacts mounted on the base plate begin to open. Tighten the clamp bolt and check to see that the segment directly opposite the rotor in the distributor head is connected to the spark plug is cylinder No. 1. Connect the remaining spark plugs in order 6-2-5-8-3-7-4 clockwise around the distributor head.

After setting ignition the car should be given a road test and the setting changed slightly to give the best performance. A slight spark knock should be audible when the car is accelerated from fifteen to twenty-five miles per hour with wide open throttle for the best performance. If the knock is too noticeable, loosen the advance arm hold-down screw and retard the spark one division on the scale by rotating the distributor in a clockwise direction. If no knock is heard the spark should be advanced by turning the distributor one division counter-clockwise. Give the car a final road test.

If the car is run with ethylized gasoline exclusively, the spark should be set $\frac{7}{8}$ inch before top dead center (on the flywheel). Set breaker so that contacts open when the top dead center marks "D.C.1-8" and "D.C.3-6" are $\frac{7}{8}$ inch before the pointer in the inspection hole in the flywheel housing.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. A.C. Type G-10. Gaps are .022 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, $1\frac{1}{2}$ inches. Stem diameter, .3085 inch. Stem length, $5\frac{1}{32}$ inches. Valve lift, .312 inch. Spring pressure, 50 pounds (valve closed). Tappet clearance, .003-.005 inch (hot).

EXHAUST VALVES. Head diameter, $1\frac{3}{8}$ inches. Stem diameter, .3085 inch. Stem length, $5\frac{1}{32}$ inch. Valve lift, .327 inch. Spring pressure, 50 pounds (valve closed). Tappet clearance, .005-.007 inch (hot).

Valve Timing. To check valve timing, first set inlet valve tappet clearance for cylinder No. 1 at proper figure and then turn engine over until the inlet opening mark 'IO' which is 7 degrees past the top dead center mark 'DC I&8' is directly in line with the pointer in the inspection hole in the front face of the flywheel housing at the right of the engine. The tappet clearance should be entirely taken up at this point and No. 1 inlet valve should begin to open.

STARTER:—**Model MAB-4034.** Starter is connected to the engine through an in-board Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter cranks the engine at 125 R.P.M. drawing 125 amperes at 5.5 volts. Brush spring tension is 36 ounces. The starter switch is mounted on the starter field frame and is operated through a flexible control by a button on the dash.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.	1910	5.5	100
3.4 "	1100	5.0	200
6.6 "	695	4.5	300
10.2 "	420	4.0	400
24.0 "	Lock	4.0	725

Mounting:—Starter is flange mounted at the left of the engine on the forward face of the flywheel housing. To remove starter, disconnect cable and ammeter lead. Remove starter switch control wire. Then take out three flange mounting cap screws. Pull starter forward to clear Bendix and lift from place.

Oiling:—Put 3 or 4 drops of light engine oil in the oiler at each end of the armature shaft every 1000 miles of operation.

GENERATOR:—**Model GAM-4102.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, loosen the commutator cover band and shift the third brush by prying on the brush mounting plate with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush is held in position by friction between the mounting plate and the end plate. With a standard car setting, the maximum charging rate is 14-16 amperes (cold) at 8 volts reached at 1900 R.P.M. or 27 M.P.H.

Generator Data		
Amperes	Volts	R.P.M.
0	6.5	620
2	6.9	710
5	7.1	830
10	7.8	1090
14	7.9	1490
15	8.0	1900

Shunt field current is 6:5 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts. Brush spring tension is 20-24 ounces.

Mounting:—Generator is cradle mounted at right of engine and is driven through a flexible hose coupling from the accessory drive shaft. To remove generator, disconnect lead and drive coupling and loosen mounting clamp band. Then slide generator from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every 1000 miles.

RELAY:—**Model CB-4016.** Relay is mounted on the generator end plate. Relay closes at 900 R.P.M. when the generator voltage reaches 7 volts and opens with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—**Soreng-Manegold Lighting Switch.** Lighting switch is mounted at the base of the steering column. The lighting fuse is mounted on the switch and two extra terminals are provided which act as junctions for the oil and gasoline gauge lines. Headlights are equipped with double filament bulbs and use the second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking and side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87.

FUSES:—Lighting fuse mounted on lighting switch is 20 ampere capacity.

HUPMOBILE

NEW CENTURY SIX MODEL (1930-31)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—Willard, Type WSB-13, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 16.8 hours. Battery is mounted under the left front seat.

IGNITION:—Coil Model IG-4080. Coil is mounted on the dash. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The ignition switch is an Electrolock Type 9-B. The Electrolock must be removed as a unit with the distributor whenever the distributor is taken off the car.

Distributor Model IGC-4046. Breaker contacts separate .018-.020 inch. To set contact gap, loosen lock nut on stationary contact mounting stud and turn up stud until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is full automatic with an auxiliary retard for starting. Retard is controlled by a button on the dash. For all ordinary operation, the button should be left in the fully advanced position (pushed all the way in toward the dash). Maximum manual advance is 30 degrees (engine). Automatic advance begins at 1000 R.P.M. of engine. Maximum automatic advance is 16 degrees reached at 3600 R.P.M. of engine.

Mounting:—Distributor is mounted at the left of the engine and is driven by an inclined shaft from the camshaft. The oil pump is mounted on the opposite end of the shaft at the right of the engine. To remove distributor, disconnect Electrolock at dash and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place. The Electrolock and distributor must be removed as a unit. Full directions on removing Electrolock from the distributor will be found in the Equipment Section.

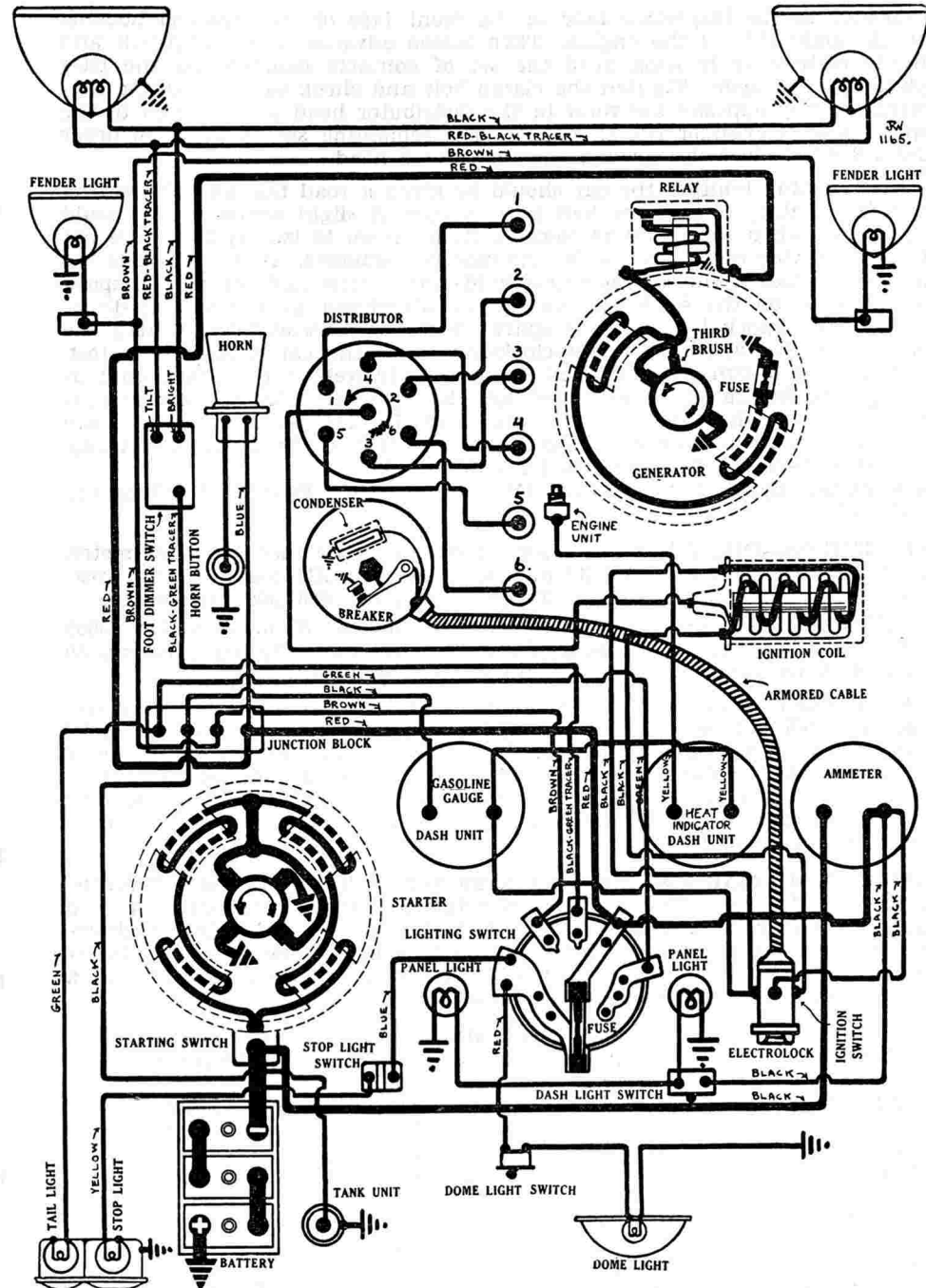
Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the side of the distributor every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and rotor and put a drop of oil on the breaker arm pivot pin and a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches top dead center. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully retard spark control button (pull button out from dash). Crank engine over until piston No. 1 reaches top dead center when the flywheel mark 'DC/1-6' will be in line with the finished boss on the flywheel housing in the inspection hole at the right of the engine. Then loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment connected to the spark plug in cylinder No. 1 (see diagram).

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. Gaps are .025-.028 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1 17/32 inches. Stem diameter, .366 inch. Stem length, 4 59/64 inches. Valve lift, 5/16 inch. Tappet clearance, .008 inch (hot). Inlet valves open 4 degrees after top dead center and close 51 degrees after lower dead center. To check valve timing, set tappet clearance of cylinder No. 1 at .010 inch. Crank engine over until piston No. 6 is at top dead center entering power stroke when the flywheel marks 'D.C./1-6' will be directly in line with the finished bosses on the



HUPMOBILE

NEW CENTURY SIX MODEL (1930-31)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

front face of the clutch housing at the right of the engine. Both the inlet and exhaust valves of cylinder No. 1 should be closed and the punch marks on the crankshaft sprocket and camshaft sprocket should be in line with the sprocket centers with all slack taken up in the driving side of the chain.

EXHAUST VALVES. Head diameter, 1 17/32 inches. Stem diameter, .366 inch. Stem length, 4 59/64 inches. Valve lift, 5/16 inch. Tappet clearance, .008 inch (hot). Exhaust valves open 47 degrees before lower dead center and close at top dead center. Valve stem guides are removable. Valves with oversize stems are made in regular sizes of .002, .004, .008 inch oversize. Valves are also made .002 inch oversize with a .024 inch oversize head.

STARTER:—Model MAJ-4003. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 2½-3 pounds. Starter switch is Model MU-2208-S. Switch is mounted on the starter field frame and is operated by a flexible control from the starting button on the dash.

Starter Data				
Torque		R.P.M.	Volts	Amperes
0 lb. ft.	3000-5000	6	.....	50
3 " "	1350	5	.....	200
5.5 " "	900	4.5	.....	300
13.5 " "	Lock	3	.....	550

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting switch control wire and take out flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler on the drive end of the starter every month or each 1000 miles of operation.

GENERATOR:—Model GAL-4124. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush and mounting plate are held in position by friction between the mounting stud and the end plate. With standard car setting the maximum charging rate is 16-17 amperes at 8 volts reached at 1900 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
0	6.2	600
8	7.1	900
17	8.0	1900
12	7.7	3200

Brush spring tension is 24-32 ounces. Shunt field current is 4.5 amperes at 6 volts. Generator motoring, draws 4.75 amperes at 6 volts. A 5 ampere field fuse is connected in the field circuit.

Mounting:—Generator is flange mounted at right of the engine on the rear of the chain case and is driven by the timing chain. To remove generator, disconnect lead and back off timing chain adjusting set screw. Then take out flange mounting cap screws and pull generator to the rear, being careful not to disturb the timing chain.

Timing Chain Adjustment. The timing chain should be adjusted at the end of the first 1000 miles and checked after every 5000 miles of operation. To adjust timing chain, loosen the three flange mounting screws and the lock nut on the adjusting set screw. Then turn up the adjusting screw until the chain begins to hum with the engine running. Back off the screw until the chain runs noiselessly and tighten the lock nut and the flange mounting screws.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

RELAY:—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Lighting switch is mounted at the lower end of the steering column. Headlights are fitted with double filament bulbs using a second 21 cp. filament controlled by a dimmer switch on the toeboard instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Generator field fuse is 5 ampere capacity. Lighting fuse mounted on the back of the lighting switch is 20 ampere capacity.

HUPMOBILE

NEW CENTURY EIGHT MODEL L (1930-31)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—Willard, Type WJ-2-13, 6 volt, 110 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 125 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 22 hours. Battery is mounted under the left front seat.

IGNITION:—Coil Model CE-4014. Coil is mounted on the dash. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The ignition switch is a Type 9-B Electrolock. The Electrolock must be removed as a unit with the distributor whenever the distributor is taken off the car. Full details of the Electrolock will be found in the Equipment Section.

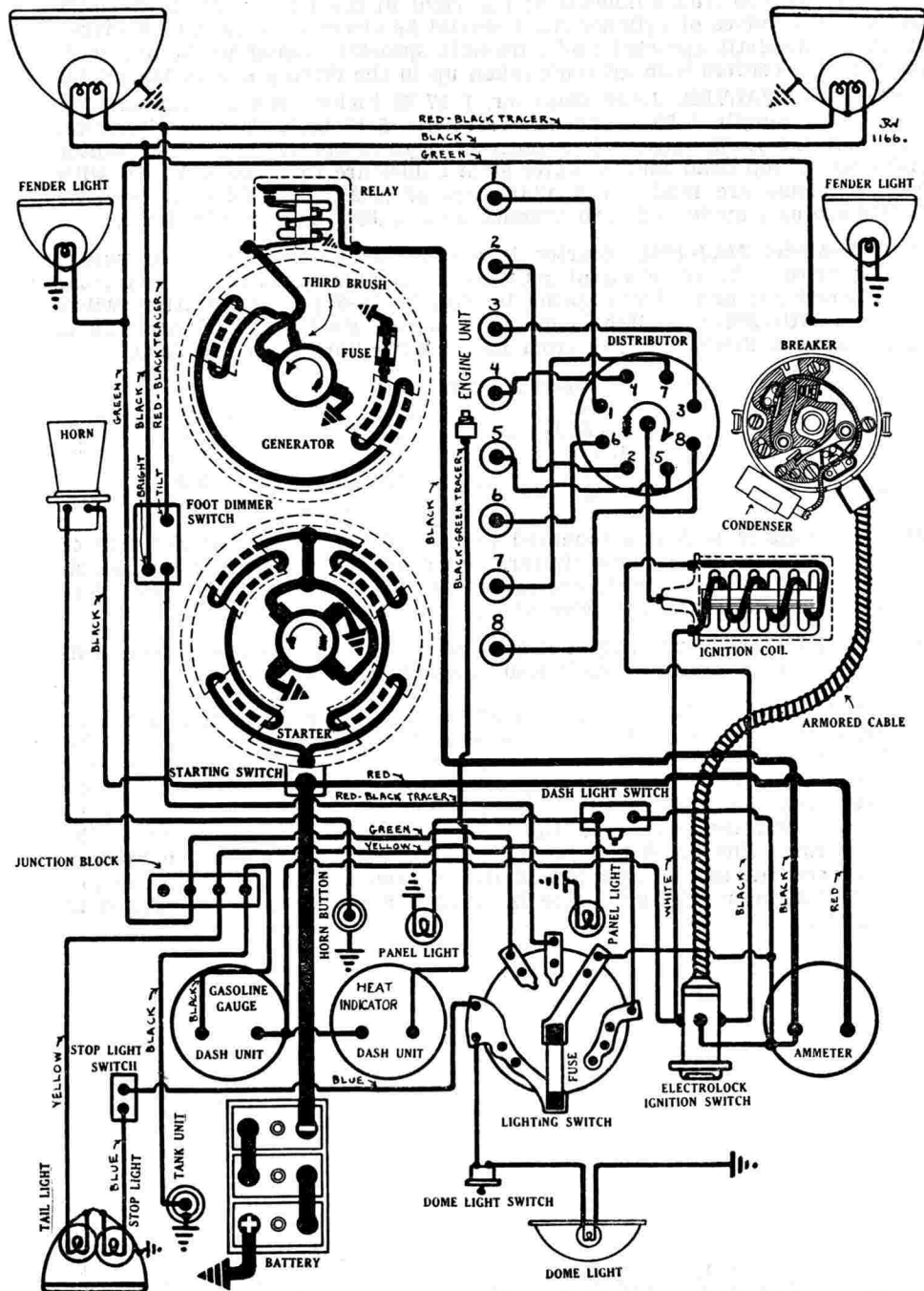
Distributor Model IGH-4008-C. Breaker contacts separate .020-.022 inch. Set contact gap (first set mounted on stationary base plate) by loosening lock screws on stationary contact mounting plate and turning up eccentric adjusting screw. The second set of contacts (mounted on movable sub-plate) are adjusted by loosening lock nut on stationary contact stud and turning up stud until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is full automatic with an auxiliary retard for starting, controlled by a button on the dash. The normal running position is with the spark control button pushed all the way in toward the dash (fully advanced). Automatic advance begins at 800 R.P.M. of engine. Maximum automatic advance is 16 degrees (engine) reached at 3600 R.P.M. Distributor has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. The contacts must be accurately synchronized to insure this firing interval for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head at the right side of the engine. To remove distributor, disconnect Electrolock at dash and remove distributor head with cables intact. Then disconnect manual spark control wire and take out hold-down screw in advance arm. Lift distributor from place.

Oiling:—Put 8 to 10 drops of light engine oil in the oiler on the side of the distributor every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and rotor and put a drop of oil on each of the breaker arm pivot pins and put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Full directions on synchronization of contacts will be found in the Equipment Section under 'Auto-Lite Distributors'. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over 90 degrees from firing position of piston No. 8 when piston No. 5 will reach top dead center entering power stroke. If the second set of contacts do not begin to open at this point, loosen the two lock screws on the mounting sub-plate and shift the plate and contact assembly until the contacts begin to open. Tighten the lock screws and check the contact gap.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches top dead center with the breaker assembly and manual spark control fully retarded. To set timing, crank engine over until piston No. 8 enters compression stroke (the up stroke with both valves closed). Fully retard manual spark control by pulling the spark control button all the way out from the dash. Crank engine over



HUPMOBILE

NEW CENTURY EIGHT MODEL L (1930-31)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

until piston reaches top dead center when the flywheel mark 'D.C./1-8' will be exactly in the center of the inspection hole in the front face of the flywheel at the right of the engine. Then loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted directly on base plate) begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment connected to the spark plug in cylinder No. 8. Connect the remaining spark plugs in order 5-2-6-1-4-7-3 clockwise around the distributor head. The firing position with manual spark control fully advanced is 20 degrees or $2\frac{1}{4}$ inches on the flywheel before top dead center.

Firing Order:—The firing order is 1-4-7-3-8-5-2-6.

Spark Plugs:—Spark plugs are 18 MM. etric. Gaps are .028-.030 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 $\frac{7}{16}$ inches. Stem diameter, .341 inch. Valve lift, .285 inch. Tappet clearance, .007 inch (hot). Inlet valves open 1 degree after top dead center and close 51 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 $\frac{11}{32}$ inches. Stem diameter, .341 inch. Valve lift, .285 inch. Tappet clearance, .014 inch (hot). Exhaust valves open 47 degrees before lower dead center and close 3 degrees after top dead center.

To check valve timing, set tappet clearance of No. 1 inlet valve at .010 inch and No. 1 exhaust valve at .020 inch. Then turn engine over until piston No. 8 reaches top dead center entering power stroke with the flywheel mark '1-8/DC' in line with the center of the inspection hole in the flywheel housing at the right of the engine. The exhaust valve in No. 1 cylinder should just close and the inlet valve just begin to open at this point. There should be nine links on the timing chain between the '0' marks on the camshaft sprocket and crankshaft sprocket at this point. Reset the tappet clearance at .007 inch (inlet) and .014 inch (exhaust) for operating.

STARTER:—**Model MAD-4113.** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 28-36 ounces. The starter switch is Model MU-2208-S. Switch is mounted on the starter field frame and is controlled by a button on the dash.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	Free	6	50
.3 "	2750	5.5	100
2.8 "	1360	5.0	200
5.7 "	800	4.5	300
8.7 "	400	4.0	400
15.2 "	Lock	3.6	760

Mounting:—Starter is sleeve mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting switch control wire. Then take out large pilot mounting screw in flywheel housing directly above starter sleeve. Pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the starter bearing oiler every two weeks or each 500 miles of operation.

GENERATOR:—**Model GAL-4138.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove commutator cover band and shift third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush and mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 17 amperes at 8 volts reached at 1900 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
0	6.2	600
8	7.1	900
17	8.0	1900
12	7.7	3200

Brush spring tension is 24-32 ounces. Shunt field current is 4.5 amperes at 6 volts. Generator motoring draws 4.75 amperes at 6 volts. A 5 ampere field fuse is connected in the field circuit.

Mounting:—Generator is mounted on a swinging bracket at the left of the engine and is driven by the fan belt. To remove generator, disconnect lead and loosen mounting clamp bolt. Swing generator toward engine and slip off drive belt. Then take out mounting pivot bolts under generator field frame and lift generator from place.

Belt Adjustment. The fan belt tension should be inspected every 1000 miles. To take up fan belt, loosen adjustment clamp bolt and pivot mounting bolts under generator. Then pull generator to left away from the engine until correct belt tension is secured and tighten clamp bolt and mounting bolts. Do not tighten belt more than is necessary to drive fan and water pump without slipping as excessive tension will cause generator bearing wear.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles.

RELAY:—**Model CB-4012.** Relay is mounted on the generator. Relay closes at 675 R.P.M. when the generator voltage reaches 7-7.5 volts and opens with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—**Soreng-Manegold Lighting Switch.** Lighting switch is mounted on the dash. Headlights are equipped with double filament bulbs controlled by a foot switch mounted on the toeboard. A second 21 cp. filament is used instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash, dome and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Generator field fuse is 5 ampere capacity. Lighting fuse mounted on the back of the switch is 20 ampere capacity.

HUPMOBILE

EIGHT CYLINDER MODEL C (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—Willard, Type SJRR-4, 6 volt, 120 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 125 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 22 hours. Battery is mounted under the left front seat.

IGNITION:—Coil Model CE-4001. Coil is mounted on the dash. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The ignition switch is an Electrolock Type 5-B. The Electrolock must be removed with the distributor as a unit whenever the distributor is taken off the car. Full details covering the Electrolock will be found in the Equipment Section.

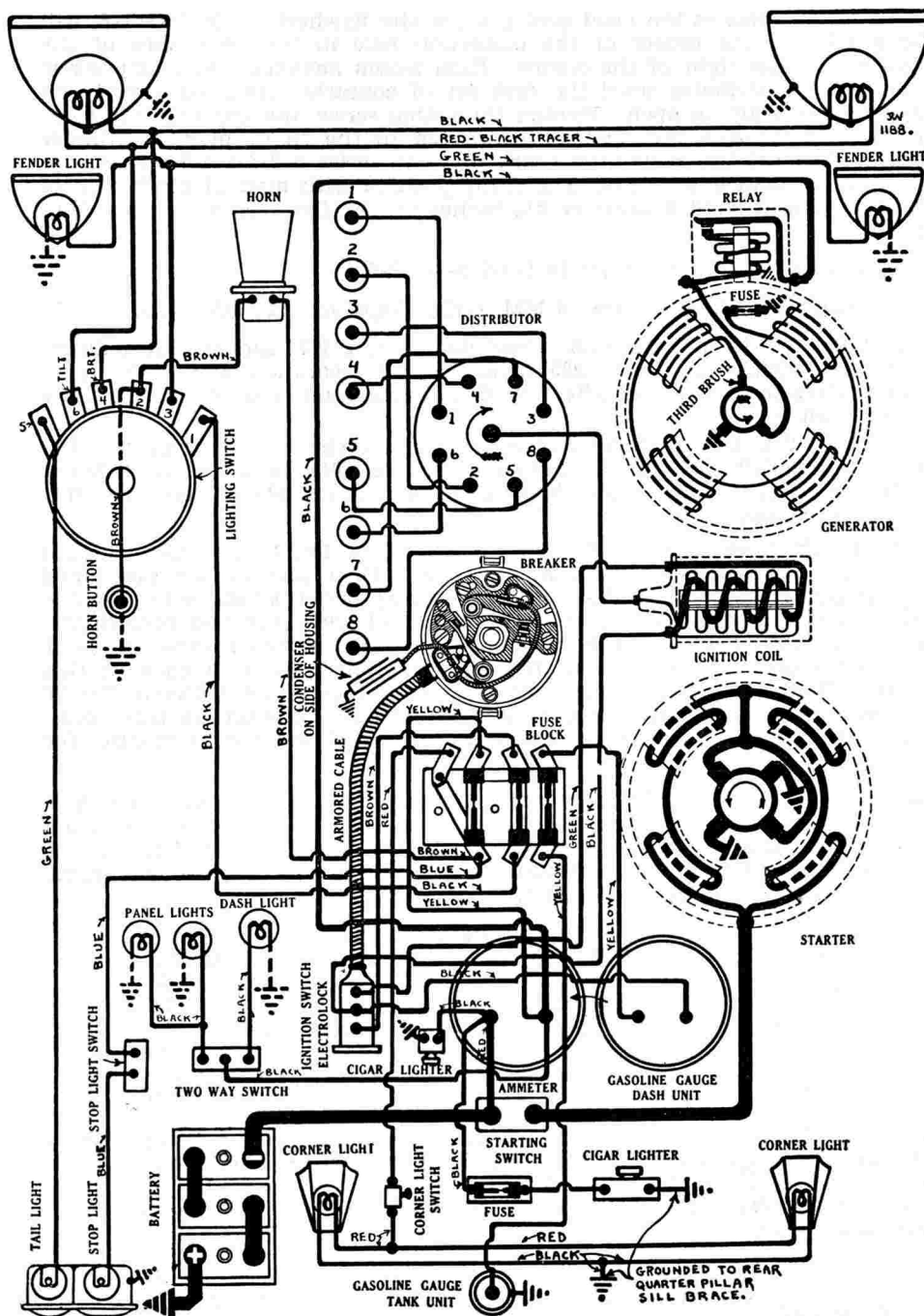
Distributor Model IGH-4008. Breaker contacts separate .020-.022 inch. Set contact gap (first set mounted on stationary base plate) by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. The second set of contacts (mounted on movable sub-plate) are adjusted by loosening lock nut on stationary contact mounting stud and turning up stud. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is full automatic with an auxiliary retard for starting. This is controlled by a button on the dash. The normal running position is with the button pushed all the way in toward the dash (fully advanced). Automatic advance begins at 800 R.P.M. of engine. Maximum automatic advance is 16 degrees (engine) reached at 3600 R.P.M. of engine. Distributor has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. The contacts must be synchronized to insure the correct interval for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, first disconnect Electrolock at dash and remove distributor head with cables intact. Then disconnect manual spark control and take out hold-down screw in advance arm. Lift distributor from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor cap and rotor and put a drop of oil on each of the breaker arm pivot pins and put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Full directions on synchronizing contacts will be found in Equipment Section listed under 'Auto-Lite Distributors.' Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over exactly 90 degrees from firing position of piston No. 8 when piston No. 5 will reach firing position. If the second set of contacts do not begin to open at this point, loosen the two lock screws on the movable sub-plate on which contacts are mounted and shift plate until contacts open. Tighten the lock screws and check the contact gap.

Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches top dead center with the spark control button in the fully retarded position (pulled out from the dash). To set timing, crank engine over until piston No. 8 enters compression stroke (the up stroke with both valves closed). Fully retard the spark control button. Continue to crank engine over until the flywheel mark '1&8'



HUPMOBILE

EIGHT CYLINDER MODEL C (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

(on the front of the flywheel at the right of the engine) is in line with the indicator on the flywheel housing. If the breaker contacts are not beginning to open, loosen advance arm clamp screw and rotate distributor until contacts open. Tighten the clamp screw and check to see that the segment directly opposite the rotor is connected to the spark plug in cylinder No. 8. Connect the remaining spark plugs in order 5-2-6-1-4-7-3 clockwise around the distributor head. There is a mark on the flywheel 9 degrees or 1 inch before the dead center mark '1&8' to indicate the firing position with the spark control button in the fully advanced position. This mark can be used in timing the engine if the spark control button is advanced, which will rotate the distributor counter-clockwise to the limit of the advance arm slot.

Firing Order:—The firing order is 1-4-7-3-8-5-2-6.

Spark Plugs:—Spark plugs are 18MM. Metric. Champion No. 8. Gaps are .028-.030 inch. Champion No. 7 should be used on engines that run hot, and No. 10 on cold engines.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1 17/32 inches. Stem diameter, 11/32 inch. Stem length, 5 13/16 inches. Valve lift, .285 inch. Tappet clearance, .007 inch (hot). Inlet valves open 1 degree after top dead center and close 51 degrees after lower dead center. The allowable variation is plus or minus 2 degrees for valve opening and plus 6 or minus 0 degrees for valve closing.

EXHAUST VALVES:—Head diameter, 1 13/32 inches. Stem diameter, 11/32 inch. Stem length, 5 13/16 inches. Valve lift, .285 inch. Tappet clearance, .014-.015 inch (hot). Exhaust valves open 47 degrees before lower dead center and close 3 degrees after top dead center. The allowable variation is plus 0 or minus 6 degrees for valve opening and plus 6 or minus 0 degrees for valve closing. Valve stem guides are removable. Valves with oversize stems are made in regular sizes of .002, .004 and .008 inch oversize. Valves are also made with .002 inch oversize stem and .024 inch oversize head.

NOTE:—To set valve timing, tappet clearance of No. 1 inlet valve should be set at .010 inch and No. 1 exhaust valve at .020 inch. There should be 14 links of the timing chain between the marks on the camshaft sprocket and the crankshaft sprocket.

STARTER:—Model MAB-4021. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 2½-3 pounds. Starter switch is Model SW-4002.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	6	50
3.5 "	1100	5	200
6.5 "	700	4.5	300
17 "	Lock	3	530

Mounting:—Starter is sleeve mounted at right of engine on rear of flywheel housing. To remove starter, take up floor boards in front compartment, disconnect cable and take out large pilot mounting screw in flywheel housing directly above starter sleeve. Then pull starter to the rear to clear drive and lift from place.

Oiling:—Starter bearings are oilless. They require no attention.

GENERATOR:—Model GAG-4118. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove commutator cover band and shift third brush by prying on brush mounting plate with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush and mounting plate are held in any position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate of 15-17 amperes is reached at 1400 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
0	6.3	580
8	7.2	820
16	8.0	1400
12	7.6	2150

A five ampere field fuse is connected in the field circuit. Brush spring tension is 16-24 ounces. Shunt field current is 4.5 amperes at 6 volts. Generator motoring draws 4.7 amperes at 6 volts.

Mounting:—Generator is flange mounted at right of engine on rear of timing chain case. To remove generator, disconnect lead and back off generator timing chain adjustment set screw. Take out three flange mounting cap screws. Then pull generator to the rear and tie up timing chain to prevent it slipping on camshaft sprocket.

Timing Chain Adjustment. Timing chain is adjusted by shifting generator. This adjustment should be made after the first 100 miles and checked after every 5000 miles of operation. To adjust timing chain, loosen the three flange mounting screws and turn up the adjustment set screw until the chain begins to hum with the engine running. Then back of the set screw until the chain runs noiselessly and tighten the mounting screws.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the commutator end of the generator every two weeks or each 500 miles of operation. The drive end bearing is oiled from the chain case.

RELAY:—Model CB-4012. Relay is mounted on the generator. Relay closes at 625 R.P.M. when the voltage of the generator reaches 7-7.5 volts and opens with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Soreng-Manegold Lighting Switch. Lighting switch is mounted at the base of the steering column. Headlights are equipped with double filament bulbs using the second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights (for parking) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing light is 6-8 volt, 15 cp. S.C. Mazda 87. Corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Generator field fuse is 5 ampere capacity. Lighting fuses mounted on block on dash (left side, under hood) are 15 ampere capacity.

HUPMOBILE

EIGHT CYLINDER MODELS H AND U (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—Willard, Type SJRR-5, 6 volt, 130 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 145 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 26 hours. Battery is mounted under the left front seat.

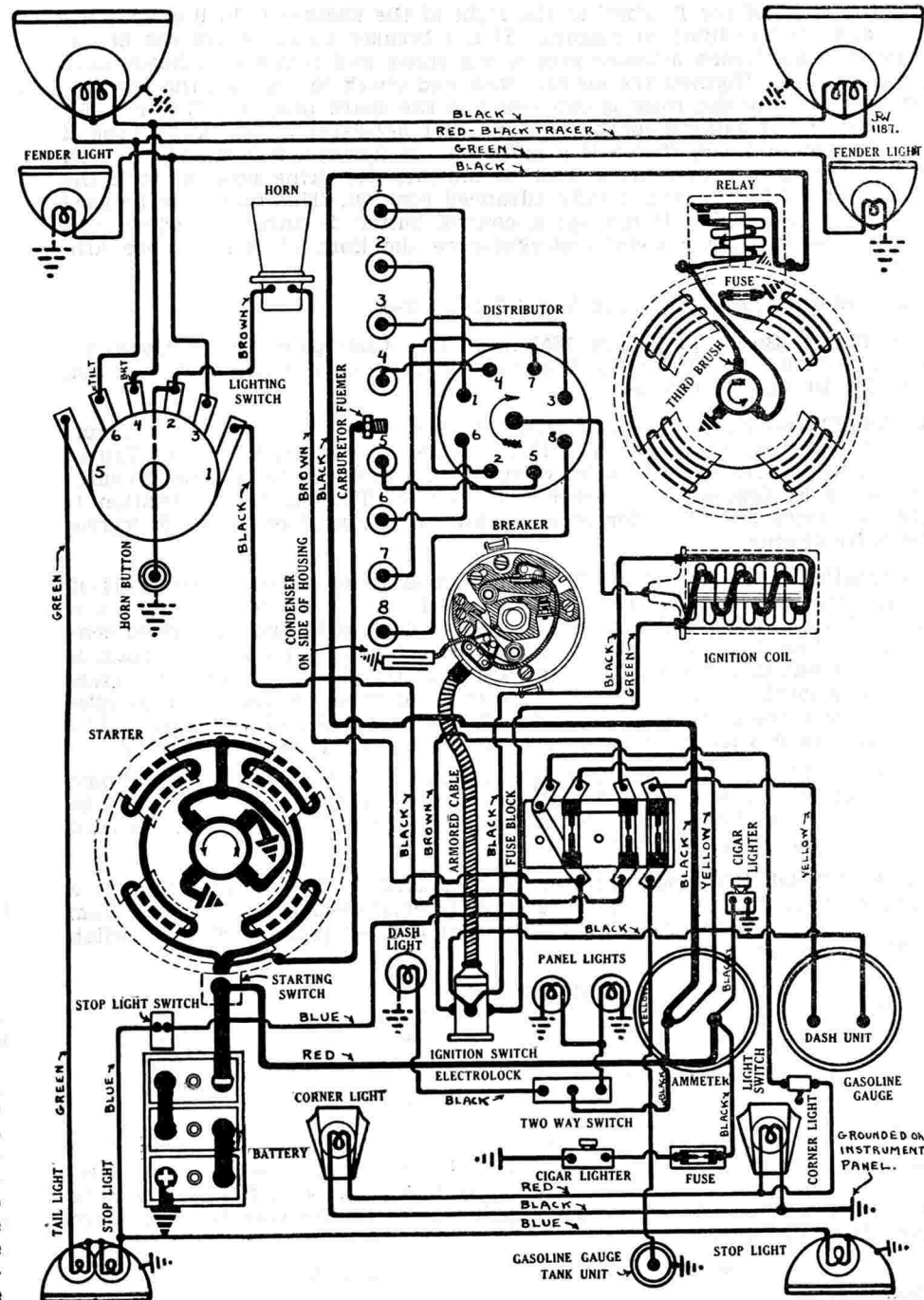
IGNITION:—Coil Model CE-4001. Coil is mounted on the dash. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The ignition switch is an Electrolock Type 9-B. The Electrolock must be removed with the distributor as a unit whenever the distributor is taken off the car.

Distributor Model IGH-4008. Breaker contacts separate .020-.022 inch. Set contact gap (first set mounted on stationary base plate) by loosening lock screws on stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. The second set of contacts (mounted on movable sub-plate) are adjusted by loosening lock nut on stationary contact mounting stud and turning up stud. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is of full automatic type with an auxiliary retard for starting controlled by a button on the dash. The normal running position is with the spark control button pushed all the way in toward the dash (the fully advanced position). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 16 degrees (engine) reached at 3600 R.P.M. of engine. Distributor has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. The contacts must be synchronized to secure the exact firing interval for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head and can be removed from the right side. To remove distributor, first disconnect Electrolock at the dash and remove the distributor head with cables intact. Then disconnect spark control wire and take out hold-down screw in advance arm. Lift distributor from place and remove distributor and Electrolock as a unit. For complete instructions on the Electrolock see Equipment Section.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor cap and rotor and put one drop of oil on the breaker arm pivot pins and put a small bit of vaseline on the face of the breaker cam.

Timing:—Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches top dead center with the spark control button in the fully retarded position. To set timing, crank engine over until piston No. 8 enters compression stroke (the up stroke with both valves closed). Fully retard spark control button by pulling the button away from the dash until the distributor is rotated clockwise the full length of the advance arm slot. Then crank engine over until piston reaches top dead center when the flywheel mark '1&8' (on the front of the flywheel at the right of the engine) will be directly in line with the mark on the flywheel housing. Loosen the advance arm clamp screw and rotate the distributor until the contacts mounted on the stationary base plate begin to open. Tighten the clamp screw and see that the segment directly opposite the rotor is connected to the spark plug in cylinder No. 8. Connect the remaining spark plugs in order 5-2-6-1-4-7-3 clockwise around the distributor head. There is a mark 9 degrees or one inch on the flywheel before



HUPMOBILE

EIGHT CYLINDER MODELS H AND U (1931)

AUTO-LITE GENERATING, STARTING SYSTEM

AUTO-LITE IGNITION

the dead center mark which can be used to time the engine with the spark control button fully advanced. If this mark is used, see that the spark control button is pushed all the way in toward the dash and that the distributor is rotated counter-clockwise to the full extent of the timing arm slot.

Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Auto-Lite tool and follow complete directions in Equipment Section. Contacts can be synchronized after distributor has been timed to the engine by cranking engine over exactly 90 degrees when piston No. 5 will reach firing position (top dead center with manual spark control fully retarded). If the second set of contacts do not begin to open at this point, loosen the two lock screws on the movable sub-plate and shift plate until contacts begin to open. Tighten the lock screws and check the contact gap.

Firing Order:—The firing order is 1-4-7-3-8-5-2-6.

Spark Plugs:—Spark plugs are 18MM. Metric. Champion No. 8. Gaps are .030 inch. Use Champion No. 7 on engines which run hot, and No. 10 on cold engines.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1.745 inches. Stem diameter, .3405 inch. Stem length, 6 13/16 inches. Valve lift, .285 inch. Tappet clearance, .007 inch (hot). Inlet valves open 1 degree after top dead center and close 51 degrees after lower dead center. The allowable variation is plus 0 or minus 6 degrees for valve opening and plus 6 or minus 0 degrees for closing.

EXHAUST VALVES:—Head diameter, 1.590 inches. Stem diameter, .3405 inch. Stem length, 6 13/16 inches. Valve lift, .285 inch. Tappet clearance, .014-.015 inch. Exhaust valves open 47 degrees before lower dead center and close 3 degrees after top dead center. The allowable variation is plus 0 or minus 6 degrees for valve opening and plus 6 or minus 0 degrees for closing. Valve stem guides are removable. Valves with oversize stems are made in regular .002, .004 and .008 inch oversizes. Valves are also made with .002 inch oversize stem and .024 inch oversize head.

NOTE:—In setting valve timing, the tappet clearance of No. 1 inlet valve should be set at .010 inch and No. 1 exhaust valve at .020 inch. There should be 11 links in the timing chain between the marks on the camshaft sprocket and the crankshaft sprocket.

STARTER:—Model MR-4102. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 2½-3 pounds. Starting switch is Model SW-2725. It is mounted on the starter field frame. There is a terminal on the starter for the carburetor fuemer connection.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	Free	5.8	70
6 "	680	5.4	200
11.5 "	450	5.0	300
33.0 "	Lock	3.0	640

Mounting:—Starter is sleeve mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and fuemer lead and starting pedal linkage. Then remove large pilot mounting screw in flywheel housing directly above starter sleeve. Pull starter forward to clear drive and

lift from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the drive end of the starter every two weeks or each 500 miles of operation.

GENERATOR:—Model GAG-4118. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush and mounting plate by prying on the mounting plate with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 15-17 amperes at 8 volts reached at 1400 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
0	6.3	580
8	7.2	820
16	8.0	1400
12	7.6	2150

A 5 ampere field fuse is connected in the field circuit. Generator brush spring tension is 16-24 ounces. Shunt field current is 4.5 amperes at 6 volts. Generator motoring draws 4.7 amperes at 6 volts.

Mounting:—Generator is flange mounted at right of engine on rear of timing chain case. To remove generator, disconnect lead and back off chain adjustment set screw. Then take out three flange mounting screws and pull generator to the rear. Tie up the timing chain to prevent chain slipping on camshaft sprocket.

Timing Chain Adjustment. Timing chain is adjusted by shifting generator. The timing chain should be taken up after the first 100 miles and should be checked every 5000 miles. To adjust chain, loosen three flange mounting screws and turn up adjustment set screw until chain begins to hum with engine running at equivalent of 25 miles per hour. Back off set screw until chain runs noiselessly and tighten mounting screws.

RELAY:—Model CB-4012. Relay is mounted on the generator. Relay closes at 625 R.P.M. when the generator voltage reaches 7-7.5 volts and opens with a discharge current of 5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Soreng-Manegold Switch. Lighting switch is mounted at base of steering column. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights (for parking) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing lights are 6-8 volt, 15 cp. S.C. Mazda 87. Corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Generator field fuse is 5 ampere capacity. Lighting fuses mounted on fuse block (left side, under hood) are 15 ampere capacity.

LA SALLE

SERIES 345—SERIAL NUMBERS 900-001 UP

PRODUCTION STARTED OCTOBER 1930

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

BATTERY:—Delco, Type 15-CW, 6 volt, 120 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 120 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 24 hours. Battery is mounted under the right front seat.

IGNITION:—Coil Model 530-B. Coil is mounted on the radiator brace rods directly over the distributor. Ignition current is 2.5 amperes with engine running and 2 ampere with engine stopped.

Distributor Model 4055. Breaker contacts separate .018-.022 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until correct gap is secured with breaker arm on lobe of cam. Tighten the lock nut. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 40 degrees (engine). Automatic advance begins at 1000 R.P.M. (engine). Maximum automatic advance is 30 degrees reached at 3800 R.P.M. Breaker has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized for correct performance. See Timing. Ignition switch is Delco-Remy Dual Lock Model 426-P.

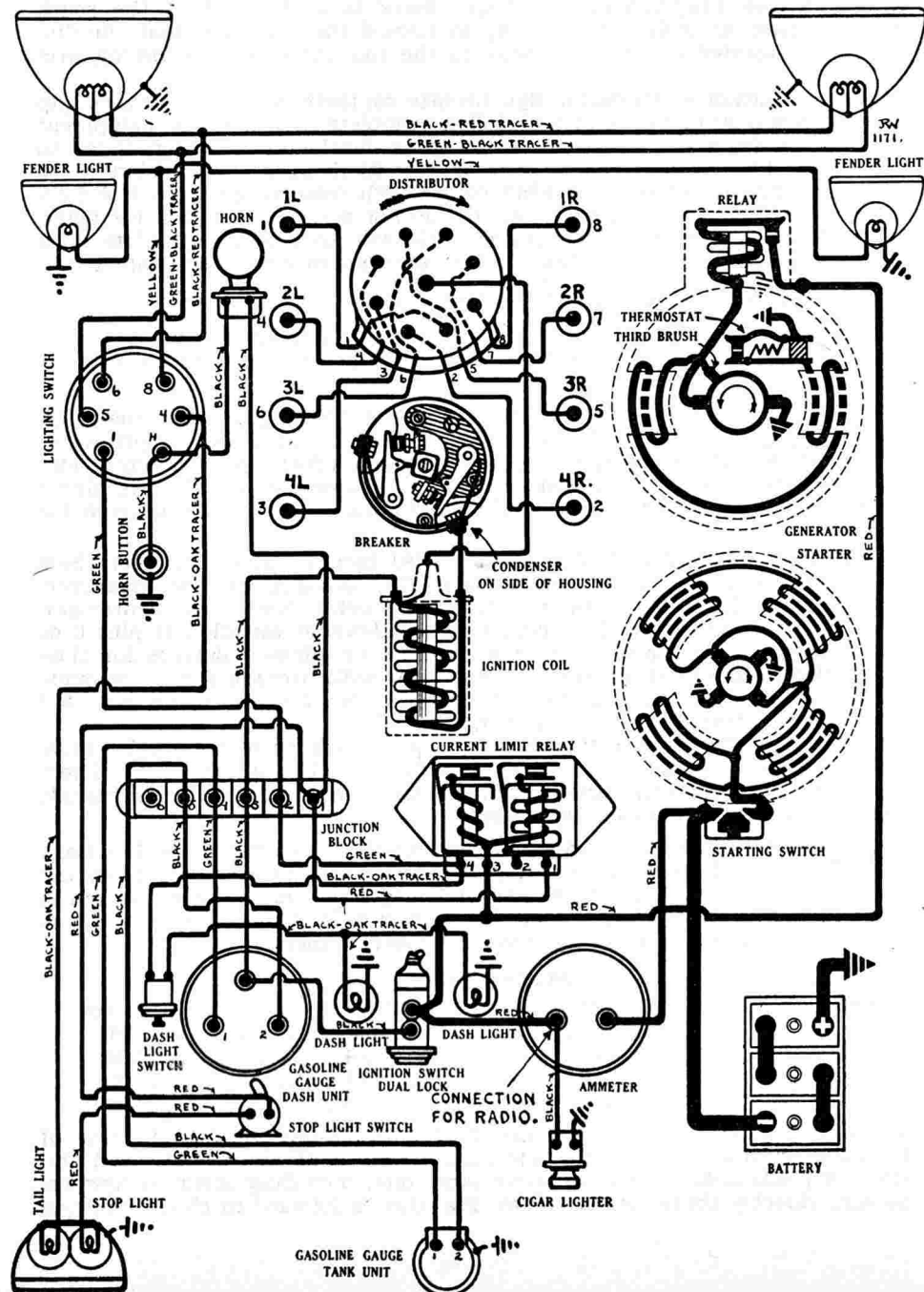
Mounting:—Distributor is mounted at the front of the engine between the cylinder blocks. To remove distributor, disconnect primary lead and spark control rod and remove distributor head with cables intact. Then take out two hold-down screws and lift distributor from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor housing every 1000 miles of operation. At the same time put a drop of oil on the breaker arm pivot pins and in the hole drilled in the top of the breaker cam which oils the path of the breaker arm rubbing blocks on the face of the cam.

Timing:—**Synchronization of Contacts.** The interval between the opening of the two sets of contacts must be exactly 45 degrees (distributor). This can be set by using special Delco-Remy Tool, Part No. 822572, and following directions on Distributors in Equipment Section. The breakers may be synchronized without use of the tool after the distributor has been timed to the engine by cranking the engine over 90 degrees from the firing position of piston No. 1 when the flywheel mark 'IG/A-2-6' will be opposite the indicator. If the second set of contacts does not open at this point, the lock screws on the breaker arm mounting plate should be loosened and the eccentric adjusting screw turned until the contacts begin to open. Then tighten the lock screws and check the contact gap.

Timing Distributor to Engine:—Breaker contacts begin to separate when the piston entering power stroke reaches a position $\frac{3}{8}$ inch (on the flywheel) before top dead center with the spark control lever in the fully advanced position. With piston No. 1 in firing position the flywheel mark 'IG/A-1-5' will be opposite the indicator on the flywheel case. This mark is $\frac{3}{8}$ inch before the top dead center position of the piston. To set timing, crank engine over until piston No. 1 reaches firing position. Fully advance spark control lever. Then loosen taper screw in center of breaker cam and rotate cam until the set of contacts mounted on the stationary breaker plate begin to open. Tighten the screw and check to see that segment directly opposite rotor is connected to the spark plug in cylinder No. 1. The second set of contacts open exactly 45 degrees after this point.

Firing Order:—The firing order is 1L-4R-4L-2L-3R-3L-2R-1R. Cylinder banks



LA SALLE

SERIES 345—SERIAL NUMBERS 900-001 UP

PRODUCTION STARTED OCTOBER, 1930

DELCO-REMY GENERATING STARTING SYSTEM

DELCO-REMY IGNITION

are right and left as viewed from the driver's seat. No. 1 cylinder is nearest the radiator.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-10. Gaps are .025-.028 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1.660-1.666 inch. Stem diameter, $\frac{3}{8}$ inch. Stem length, 6 $\frac{17}{64}$ inches. Valve lift, $\frac{23}{64}$ inch. Spring pressure, 79 pounds (spring length, 2 $\frac{1}{2}$ inches) and 160 pounds (spring length, 2.148 inches). Tappet clearance, .004 inch (hot). Inlet valves open 9 degrees before top dead center and close 58 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1.634-1.640 inches. Stem diameter, $\frac{3}{8}$ inch. Stem length, 6 $\frac{1}{4}$ inches. Valve lift, $\frac{23}{64}$ inch. Spring pressure, 79 pounds (spring length, 2 $\frac{1}{2}$ inches) and 160 pounds (spring length, 2.148 inches). Tappet clearance, .006 inch (hot). Exhaust valves open 46.5 degrees before lower dead center and close 7 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 728-D.** Starter is connected to the engine through a manual pinion shift interconnected with the starting switch and an overrunning clutch. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3	600

Mounting:—Starter is mounted at right of engine on rear of flywheel case. To remove starter, disconnect cable and starting pedal linkage and take out three flange mounting cap screws. Then pull starter to rear to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in each starter oiler every 1000 miles. Every six months repack the reduction gear housing with graphite grease.

GENERATOR:—**Model 927-D.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at approximately 165°F. cutting the resistance in series with the field and reducing the output 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the end plate. Then shift the third brush mounting plate by hand. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after mak-

ing the adjustment. The maximum standard charging rate is 10-12 amperes (hot) at 7.3-7.7 volts reached at 1600 R.P.M. or 25 miles per hour.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.2-8.6	1450	10-12	7.3-7.7	1600

Brush spring tension is 16-20 ounces. Generator field current is 1.8-2.3 amperes at 6 volts.

Mounting:—Generator is flange mounted at right of engine on the rear of the chain case. The water pump is mounted on the front face of the chain case. To remove generator, disconnect lead and drop mud pan at right of engine. Then remove nuts on two upper flange mounting bolts and take out lower flange mounting cap screw. Pull generator to the rear to disengage drive coupling. The generator can then be taken out from underneath the car.

Drive Chain Adjustment. To adjust generator and water pump drive chain, loosen two pivot screws and nuts on flange mounting. Then force water pump away from engine until chain is tight. Then back off approximately $\frac{1}{8}$ inch and tighten mounting screws and nuts.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 500 miles of operation.

RELAY:—**Model 266-N.** Relay is mounted on the generator. Relay closes at 420 R.P.M. or 8-10 miles per hour when the generator voltage reaches 7.5 volts and opens with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.021 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—**Switch Model 486-D.** Lighting switch is mounted at lower end of the steering column. Double filament headlights using the second 21 cp. filament instead of dimmers are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights or parking lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome and corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

CURRENT LIMIT RELAY:—**Model 5759.** This device consists of a vibrating and lockout circuit breaker mounted on the dash. The vibrating unit protects the lighting circuits. It starts to operate when the current reaches 25-30 amperes and continues limiting the current to 5-15 amperes. The lockout circuit breaker protects the horn, stop light, inspection light, cigar lighter and body light circuits. It begins to operate when the current reaches 25-30 amperes and continues limiting the current to less than 1 ampere. Contact gap is .012-.030 inch. Air gap between armature and coil core is .015-.025 inch. Plunger spring tension is 5 ounces.

LINCOLN

1931 MODEL SERIAL NUMBERS 66,001 UP
PRODUCTION STARTED DECEMBER, 1930
AUTO-LITE GENERATING, STARTING SYSTEM
AUTO-LITE IGNITION

BATTERY:—Exide, Type 3-LXC-15-1RD, 6 volt, 135 ampere hour. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 137 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 26 hours. Battery is mounted on the frame member under the floor boards of the front compartment.

IGNITION:—Coil Model CE-4001-L (2 used). Ignition coils are mounted on the dash under the cowl. Ignition current is 1.45-4 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts (each coil) with the engine stopped. The ignition switch is a Cutler-Hammer push-and-pull switch built in the co-incidental steering post and ignition switch lock.

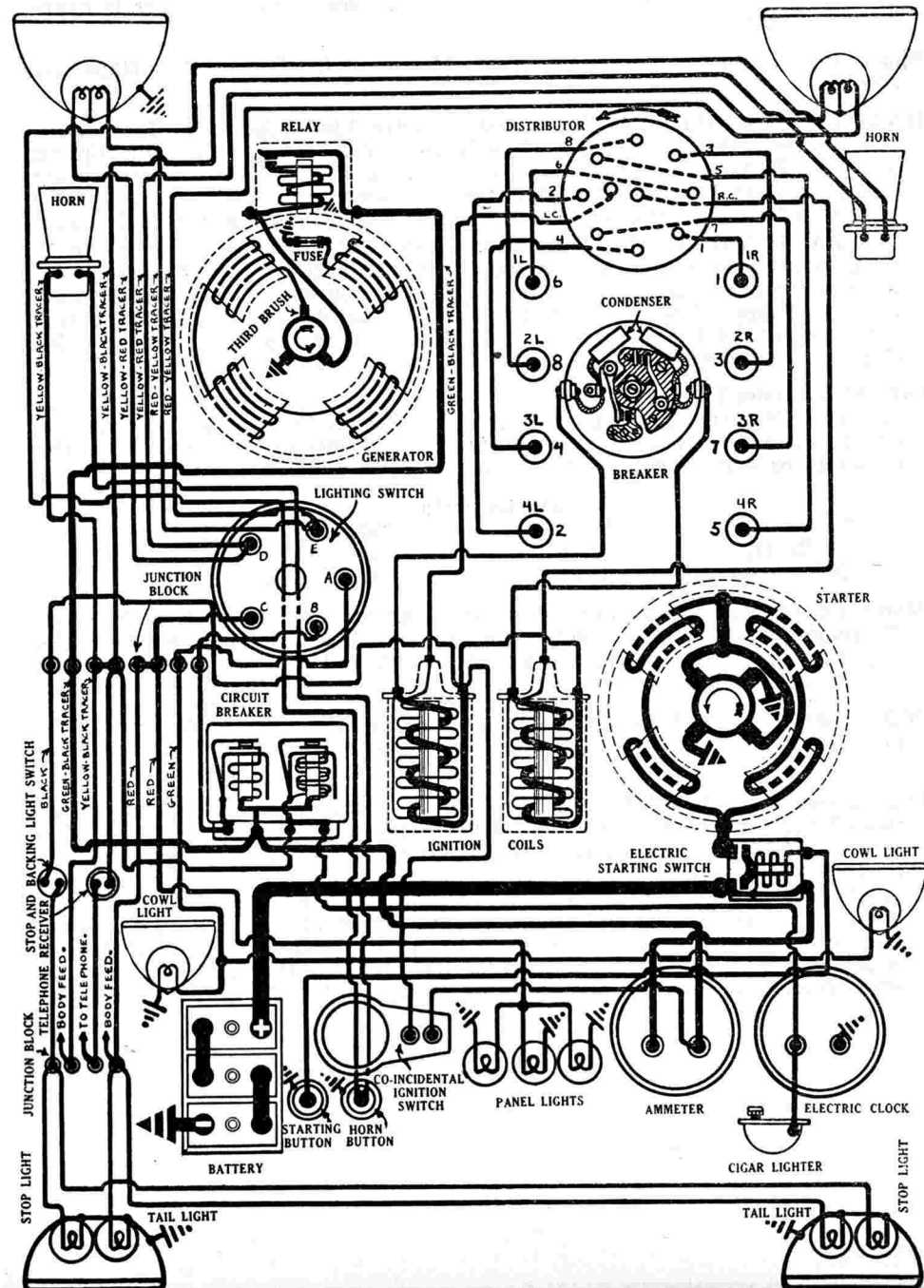
Distributor Model IGL-4001. Breaker contacts separate .020 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw. The second set mounted on the movable sub-plate are adjusted by loosening the lock nut on the stationary contact mounting stud and turning up the stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 24 ounces. Distributor is semi-automatic. Maximum manual advance is 10 degrees (distributor). Automatic advance begins at 800 R.P.M. of the engine. Maximum automatic advance is 13 degrees (distributor) reached at 3300 R.P.M. of the engine. The breaker has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 30 and 60 degrees corresponding to the alternate firing intervals of 60 and 120 degrees of the engine. Contacts must be accurately synchronized to secure this firing interval for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted between the cylinder banks at the forward end of the engine. To remove distributor, disconnect primary leads and manual spark control and remove distributor cap and cable assembly. Then take out two hold-down screws in advance arm and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler on the side of the distributor every 500 miles of operation. Every 1000 miles remove the distributor cap and rotor and put one drop of oil on the breaker arm pivot pins and place a thin film of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to separate when the piston entering power stroke reaches a position 7 degrees (on the flywheel) before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 2R (right hand block) enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control and remove the cover plate over the inspection hole in the flywheel case. Turn engine over until the seven degree mark on the flywheel (which is 7 degrees before the top dead center mark for cylinder No. 2R, '2-D.C.') is opposite the indicator on the housing. Then loosen the lock screw in the center of the breaker cam and carefully locate the cam so that the first set of contacts (mounted directly on the breaker plate) are beginning to open. Tighten the lock screw. The second set of contacts begin to open 30 degrees after this point when piston No. 1L reaches firing position. This set of contacts is timed by synchronizing contacts.

Synchronization of Contacts. Crank engine over 60 degrees from firing position of piston No. 2R until piston No. 1L reaches a position 7 degrees before top dead center with the seven degree mark for this cylinder (which



LINCOLN

1931 MODEL SERIAL NUMBERS 66,001 UP PRODUCTION STARTED DECEMBER, 1930 AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

is 7 degrees before the top dead center mark 'I-DC') opposite the indicator. Then loosen the lock screws on the movable sub-plate and shift the plate until the second set of contacts begin to open. Tighten the lock screws and connect the spark plugs as indicated on the diagram.

Firing Order:—The firing order is 1-2-3-4-5-6-7-8 with spark plugs numbered as shown on the diagram. This firing order is 1R-4L-2R-3L-4R-1L-3R-2L with cylinder banks right and left, as viewed from the driver's seat and No. 1 cylinder nearest the radiator.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Std. Champion, Type C-4. Gaps are .025-.030 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 2 inches. Stem diameter, $\frac{3}{8}$ inch. Stem length, $6\frac{3}{4}$ inches. Valve lift, $1\frac{1}{32}$ inch. Tappet clearance, .005 inch (cold). Inlet valves open $22\frac{1}{2}$ degrees before top dead center and close 66 degrees after lower dead center.

EXHAUST VALVES. Head diameter, $1\frac{7}{8}$ inches. Stem diameter, $\frac{3}{8}$ inch. Stem length, $6\frac{3}{4}$ inches. Valve lift, $5/16$ inch. Tappet clearance, .005 inch (cold). Exhaust valves open $48\frac{1}{2}$ degrees before lower dead center and close at top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model MAL-4001 (Domestic) MAL-4002 (Export). Starter is connected to the engine through an outboard Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. The starting switch is an electro-magnetic unit mounted on the starter field frame. It is controlled by a button on the dash.

Starter Data			
Torque	R.P.M.	Volts	Amperes
1 lb. ft.	2000	5.5	100
4.5 "	1000	5.0	200
8.25 "	640	4.5	300
12.75 "	375	4.0	400
22 "	Lock	3.0	600
32 "	Lock	4.0	825

Mounting:—Starter is flange mounted at the right of the engine (domestic models) or at the left of the engine (export models) on the forward face of the flywheel housing. To remove starter, disconnect starter cable or take off starting switch and take out three flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—There is an oiler at each end of the starter armature. The bearing at the outer end of the shaft is oilless. Put 5 or 6 drops of light engine oil in each starter oiler every 1000 miles of operation.

GENERATOR:—Model GAU-4001. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, loosen the commutator cover band and shift the third brush mounting plate. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The third brush and

mounting plate are held in position by friction between the mounting plate and the generator end plate. With standard car setting, the maximum charging rate is 16 amperes (cold) at 8 volts reached at 1650 R.P.M.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	525	0	6.4	580
4	6.8	640	4	7.0	725
8	7.2	780	8	7.3	960
12	7.4	960	10	7.6	1140
17	8.0	1650	13	8.0	1660
11	7.4	2400	9	7.5	2400

There is a 7.5 ampere field fuse mounted under a fuse plug on the commutator end plate.

Mounting:—Generator is mounted on a special swinging bracket at the left of the engine and is driven by belt from the crankshaft. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then take out two bolts forming bracket hinges under generator and lift generator from place.

Belt Adjustment. The drive belt is adjusted by loosening the hinge bolts and the adjustment clamp bolt and swinging the generator away from the engine until the proper belt tension is secured. The adjustment clamp bolt must be tightened to hold the adjustment. The belt tension should be just sufficient to drive the generator without slipping.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler at each end of the generator every 500 miles of operation.

RELAY:—Model CB-4014-L. Relay is mounted on the generator field frame. Relay contacts close at 450-525 R.P.M. or 7 M.P.H. when the generator voltage reaches 6.4 volts and open with a discharge current of 1-2.5 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Lighting switch is mounted at the lower end of the steering column. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing lights are 6-8 volt, 21 cp. S.C. Mazda 1129. Dash or instrument panel and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome and corner lights are 6-8 volt, 6 cp. S.C. Mazda 81.

CURRENT LIMIT RELAY:—Model 5778. This device consists of a vibrating and lock-out circuit breaker mounted under a single cover on the dash. The vibrating circuit breaker is connected in the lighting circuits. It begins to operate when the current reaches 28-33 amperes and continues limiting the current to 15 amperes maximum. The lock-out circuit breaker is connected in the horn and signal light circuits. It operates when the current reaches 25-30 amperes holding the current down to less than one ampere. Circuit breaker contact gap is .012-.030 inch. Air gap is .019-.025 inch.

MARMON

MODEL 70 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—National, Type H3-15X, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 120 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 22 hours. Battery is mounted on the left frame member under the driver's seat.

IGNITION:—Coil Model 528-K. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 2.5 amperes at 6 volts with engine running and 4.7 amperes at 6 volts with engine stopped.

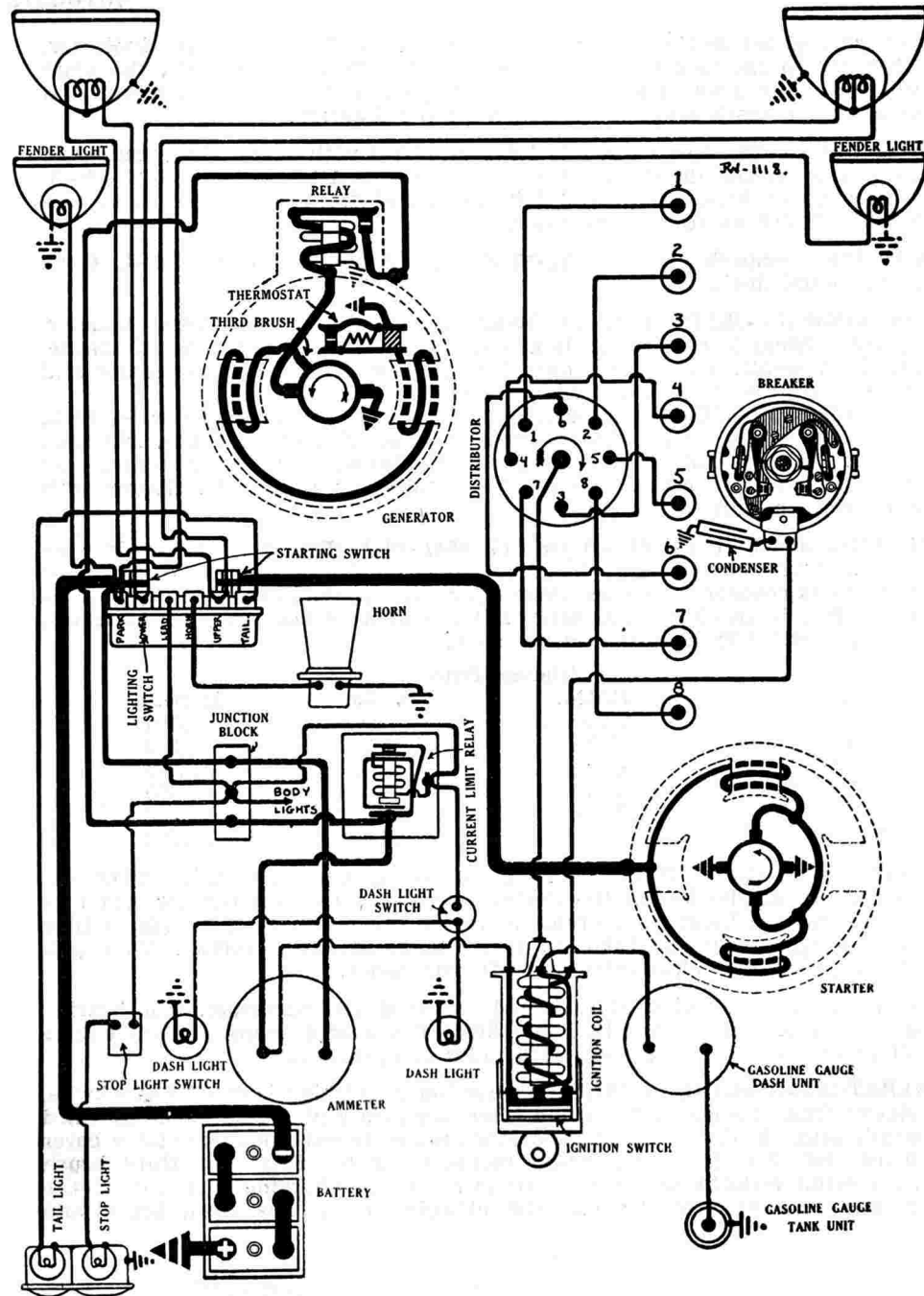
Distributor Model 652-D. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until gap is .022 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 20 ounces. Distributor is semi-automatic. Maximum manual advance is 20 degrees. Automatic advance begins at 900 R.P.M. of engine. Maximum automatic advance is 16 degrees reached at 4800 R.P.M. of engine. Manual advance is controlled by a button on the dash and distributor is designed to operate with the spark control button in the fully advanced position. Pulling out the button provides an auxiliary retard for starting. Breaker has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized to secure this firing interval for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head and can be removed from the right side. To remove distributor, disconnect primary lead and spark control wire and remove distributor head with cables intact. Then take out stop screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down one full turn every month or each 750 miles. Every 1000 miles remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

Timing:—Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position $11^{\circ}15'$ or three teeth (on the flywheel) before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Place spark control button in the fully advanced position (pushed all the way in toward the dash) and see that distributor is turned counter-clockwise to the full limit of the advance arm slot. Continue to crank engine over until the top dead center mark 'D.C.' is three teeth before the indicator on the flywheel case. Then loosen advance arm clamp screw and rotate distributor until the first set of contacts mounted on the base plate begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs in order 6-2-5-8-3-7-4 clockwise around the distributor head.

Synchronization of Contacts. Full directions for synchronization of contacts and use of the special Delco-Remy tool, Part No. 820738, are given in the Equipment Section. Contacts can be synchronized without special equip-



M A R M O N

MODEL 70 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

ment after distributor has been timed to the engine by cranking engine over exactly 90 degrees when piston No. 6 will reach firing position (three teeth on the flywheel before top dead center). If the second set of contacts do not open at this point, loosen the two lock screws on the movable sub-plate and turn the eccentric adjusting screw until contacts open. Tighten the lock screws and check the contact gap with the breaker arm on the lobe of the cam. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. Short. Gaps are .027-.028 inch.

VALVE TIMING:—**INLET VALVES:** Head diameter, 1 15/32 inches. Stem diameter, .3095 inch. Stem length, 4 57/64 inches. Valve lift, 21/64 inch. Spring pressure, 43 pounds (valve closed) and 80 pounds (valve open). Tappet clearance, .008 inch (hot). Inlet valves open 6 degrees before top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, 1 11/32 inches. Stem diameter, .3085 inch. Stem length, 4 57/64 inches. Valve lift, 21/64 inch. Spring pressure, 43 pounds (valve closed) and 80 pounds (valve open). Tappet clearance, .008 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 6 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 714-C.** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces. Starter switch is combined with the lighting switch at the lower end of the steering column.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5	65
12 "	Lock	3.63	475

Mounting:—Starter is flange mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect cable and take out flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the commutator end of the starter every month or each 750 miles. The drive end bearing is oilless.

GENERATOR:—**Model 949-X.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 162°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the generator end plate. Then shift

the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting maximum charging rate is 9-12 amperes (hot) reached at 2000 R.P.M. or 30 miles per hour.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
21	8.5	1450	12	7.5	2000

Brush spring tension is 14-18 ounces. Shunt field current is 4-6.1 amperes at 6 volts. Generator motoring draws 5.5 amperes at 6 volts.

Mounting:—Generator is mounted by special swinging bracket at left of engine and is driven by the fan belt. To remove generator, disconnect lead and loosen mounting clamp bolt. Swing generator toward engine and slip off drive belt. Then take out two bolts mounting generator on bracket and lift generator from place.

Fan Belt Adjustment. The fan belt is adjusted by shifting the generator. To adjust belt tension, loosen the adjustment clamp bolt and swing generator out from engine until correct belt tension is secured. Tighten the clamp bolt. The belt should have sufficient tension to drive generator and fan without slipping. Any excessive tension will cause wear in the generator bearings.

Oiling:—Put 4 or 5 drops of light engine oil in each of the generator bearing oilers every month or each 750 miles.

RELAY:—**Model 265-B.** Relay is mounted on the generator. Relay contacts close at 575 R.P.M. or 8 M.P.H. when the generator voltage reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Pines 'Finger Tip Control' Switch Model 312.** Lighting switch is mounted at lower end of steering column. It incorporates the lighting switch, horn button and starting switch in a single unit controlled by a button on the steering wheel. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail light is 6-8 volt, 21-2 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light wire must be connected to the 2 cp. filament. Dome light is 6-8 volt, 3 cp. S.C. Mazda 63.

CURRENT LIMIT RELAY:—**Model 410-C.** This device is a vibrating circuit breaker mounted on the dash. It is connected in the lighting circuits to protect them from overload and short-circuits. The circuit breaker begins to vibrate when the current reaches 25-30 amperes and continues limiting the current to 2-15 amperes. Contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed.

M A R M O N

MODEL 88 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Exide, Type 3MXC-19-1, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 171 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 31 hours. Battery is mounted on left frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 528-K. The ignition switch is built in the base of the coil. Ignition coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 2.5 amperes at 6 volts with engine running and 4.7 amperes at 6 volts with engine stopped.

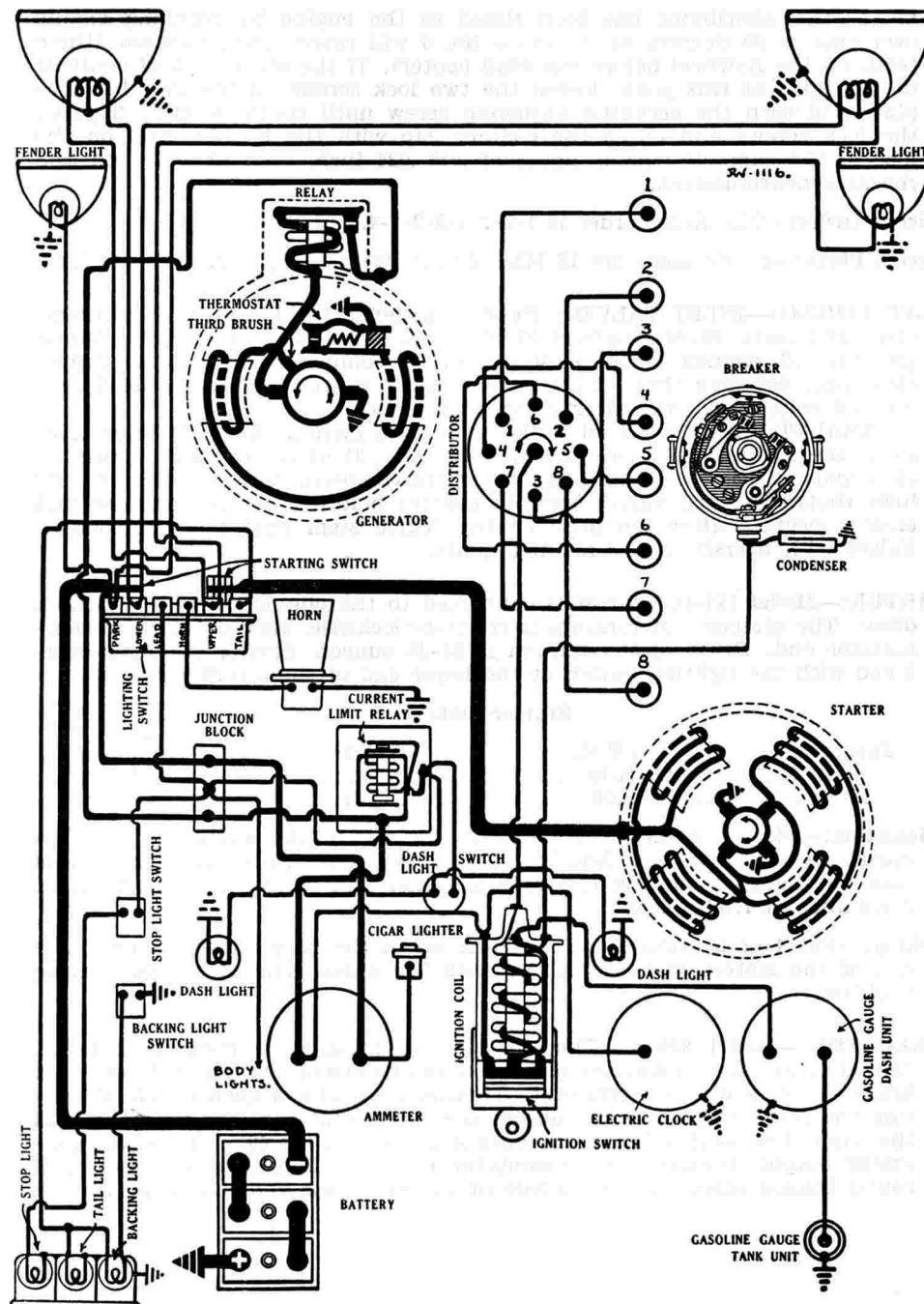
Distributor Model 652-D. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until gap is .022 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine). Automatic advance begins at 900 R.P.M. of engine. Maximum automatic advance is 17 degrees reached at 4800 R.P.M. of engine. The manual advance is controlled by a button on the dash. The fully advanced position is with the button pushed all the way in toward the dash. The breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized to secure this exact firing interval for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect primary lead and spark control wire and remove distributor head with cables intact. Then take out stop screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the shaft with medium cup grease and turn down one full turn every month or each 750 miles. Every 1000 miles remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil. Put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Full directions for synchronization of contacts and the use of the special Delco-Remy tool, Part No. 820738, are given in the Equipment Section. Contacts can be synchronized without special equipment after the distributor has been timed to the engine by cranking the engine over exactly 90 degrees when piston No. 6 will reach firing position (piston on compression stroke 2 flywheel teeth before top dead center). If the second set of contacts does not open at this instant, loosen two lock screws on movable sub-plate and turn eccentric adjusting screw until contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .022 and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches a position 5°40' or two teeth on the flywheel before top dead center with the spark control button in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Advance spark control button and see that distributor is rotated counter-clockwise to the full extent of the advance arm slot. Continue to crank engine over until a point on the flywheel two teeth before the top dead



MARMON

MODEL 88 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

center mark 'D.C.' is directly opposite the indicator on the crankcase. Then loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted on the stationary base plate) begin to open. Tighten the clamp screw and see that the segment directly opposite the rotor is connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs in order 6-2-5-8-3-7-4 clockwise around the distributor head.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18MM. Metric. Champion Type 8-S. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 11/16 inches. Stem diameter, .3417 inch. Stem length, 6 1/64 inches. Valve lift, 11/32 inch. Spring pressure, 55 pounds (valve closed) and 100 pounds (valve open). Tappet clearance, .008 inch (hot). Inlet valves open at top dead center and close 50 degrees after lower dead center. The flywheel is marked 'DC.1&8' at the point of inlet opening for cylinders Nos. 1 and 8.

EXHAUST VALVES. Head diameter, 1 9/16 inches. Stem diameter, .3407 inch. Stem length, 6 1/64 inches. Valve lift, 11/32 inch. Spring pressure, 55 pounds (valve closed) and 100 pounds (valve open). Tappet clearance, .008 inch (hot). Exhaust valves open 50 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 718-M.** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces. Starter cranks the engine at 125 R.P.M. Starter switch is combined with the lighting switch at the lower end of the steering column.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	1227	5.5	65
16 "	Lock	3.15	570

Mounting:—Starter is mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and take out flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the commutator end of the starter every month or each 750 miles. The drive end bearing is oilless.

GENERATOR:—**Model 949-F.** Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 162°F. cutting the

resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 12 amperes (hot) at 7.5 volts reached at 2000 R.P.M. or 30 miles per hour.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
21	8.4	1600	12	7.5	2000

Shunt field current is 5 amperes at 6 volts. Generator motoring draws 6 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is cradle mounted at the left of the engine and is driven by the fan belt. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump coupling and remove clamp band stud nut. Then lift generator from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every month or each 750 miles.

RELAY:—**Model 265-B.** Relay is mounted on the generator. Relay contacts close at 600 R.P.M. when the generator voltage reaches 6.5-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Pines 'Finger Tip Control' Switch Model 312. Lighting switch is mounted at lower end of steering column. The lighting switch, starting switch and horn button are incorporated in a single unit controlled by a button on the steering wheel. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights (for parking) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing lights are each 6-8 volt, 15 cp. S.C. Mazda 87. Dome and corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

CURRENT LIMIT RELAY:—**Model 410-C.** This device is a vibrating circuit breaker mounted on the dash. It is connected in the lighting circuits and is designed to protect them against excessive load and short-circuits. The circuit breaker begins to operate when the current reaches 25-30 amperes and continues limiting the current to 2-15 amperes. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed.

**SIX SERIES 6-60 (1931) SERIAL NUMBERS R-249,708 UP
PRODUCTION STARTED AUGUST 1930
AUTO-LITE GENERATING, STARTING SYSTEM
AUTO-LITE IGNITION**

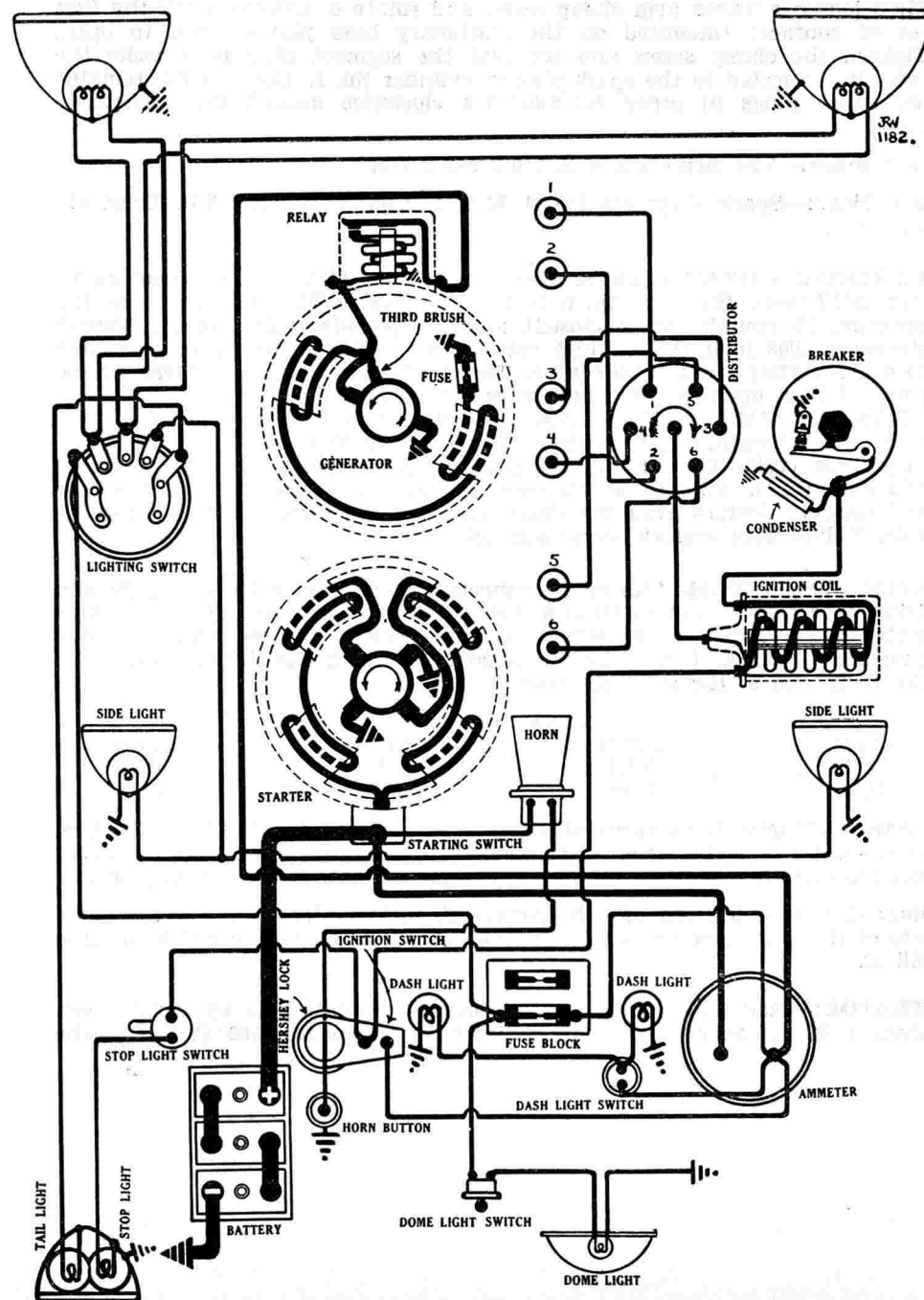
IGNITION:—Coil Model IG-4065. Coil is mounted on the engine side of the dash. Ignition current is 2 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped. Ignition switch is an Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

Mounting:—Distributor is mounted on the cylinder head and is driven through a spiral gear from the center of the camshaft. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then take out set screw and lock nut in side of cylinder head and lift distributor from place.

Timing:—Breaker contacts begin to separate with No. 1 piston on compression stroke at the point before top dead center when the first notch in the rim of the flywheel is opposite the indicator on the flywheel housing in the inspection hole in the forward face of the engine support at the right of the engine. The inspection hole is directly to the rear of the fuel pump which should be removed so that the marks can be observed. This notch is approximately $\frac{1}{2}$ inch before the notch indicating top dead center. To set timing with crankshaft turned to firing position for No. 1 cylinder (as above), loosen the clamp screw in the side of the cylinder head and rotate the distributor housing until the contacts begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment connected to the spark plug in cylinder No. 1.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-14. Gaps are .018-.023 inch.

EXHAUST VALVES. Head diameter, 1 13/32 inches. Stem diameter, .3095 inch. Stem length, 5 9/16 inches. Valve lift, 5/16 inch. Spring pressure, 45 pounds (valve closed) and 76 pounds (valve open). Tappet clearance, .008 inch. Exhaust valves open 45 degrees before lower dead center and close 5 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.



NASH

SIX SERIES 6-60 (1931) SERIAL NUMBERS R-249,708 UP PRODUCTION STARTED AUGUST 1930 AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

STARTER:—Model MAB-4026. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter switch is Model SW-3080. Switch is mounted on the starter and is operated through a flexible control from a button on the dash. Starter cranks the engine at 200 R.P.M. drawing 150 amperes at 6 volts. Brush spring tension is 18-36 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.....	1900.....		100
3.5 ".....	1100.....		200
6.6 ".....	700.....		300
10.2 ".....	410.....		400
24 ".....	Lock.....		725

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect starting cable and switch control and take out flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of engine oil in the oiler at each end of the starter every month or each 1000 miles of operation.

GENERATOR:—Model GAL-4239. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush and mounting plate by tapping on the mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 17-18 amperes at 8 volts reached at 1800 R.P.M. or 24 miles per hour.

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	675
6	6.9	835
10	7.3	1025
14	7.65	1275
17.2	8.0	2075
14	7.65	2925

A 5 ampere field fuse is connected in the field circuit. Brush spring tension is 24-32 ounces. Generator motoring, draws 4.7-5.7 amperes at 6 volts. Shunt field current is 4.2 amperes at 6 volts.

Mounting:—Generator is flange mounted at left of engine on rear face of front engine cross member. Generator is belt driven from the crankshaft. To remove generator, disconnect lead and take off drive pulley and belt. Free brace strap at rear of generator. Then take out flange mounting bolts and lift generator from place.

Oiling:—Put 4 or 5 drops of engine oil in each of the generator bearing oilers every two weeks or each 500 miles of operation.

RELAY:—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 9-9.5 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contacts separate .025-.035 inch. Air gap between relay armature and coil core is .010-.030 inch with contacts closed.

LIGHTING:—Soreng-Manegold Switch Model 4210-A. Lighting switch is mounted at the base of the steering column. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side, dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 4cp. D.C.

FUSES:—Lighting fuse mounted on fuse block on the dash is 20 ampere capacity. Generator field fuse is 5 ampere capacity.

NASH

EIGHT SERIES 8-70 (1931) SERIAL NUMBERS X-1001 UP PRODUCTION STARTED SEPTEMBER 1930 AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—U.S.L., Type 3-HVX-6X6, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 127 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 23 hours. Battery is mounted under the left hand front seat.

IGNITION:—Coil Model IG-4065. The coil is mounted on the engine side of the dash under the hood. Ignition current is 2 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hersey' type co-incidental ignition switch and steering post lock.

Distributor Model IGH-4017. Breaker contacts separate .020-.024 inch. Set contact gap by loosening lock screws on stationary contact mounting plate and turning eccentric adjusting screw (first set of contacts mounted on breaker plate) or loosening the lock nut on the stationary contact mounting stud and turning up the stud (second set of contacts mounted on movable sub-plate). Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is full automatic. Automatic advance begins at 600 R.P.M. of the engine. Maximum automatic advance is 28 degrees reached at 3400 R.P.M. of the engine. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized to secure this firing interval for satisfactory performance. See Timing.

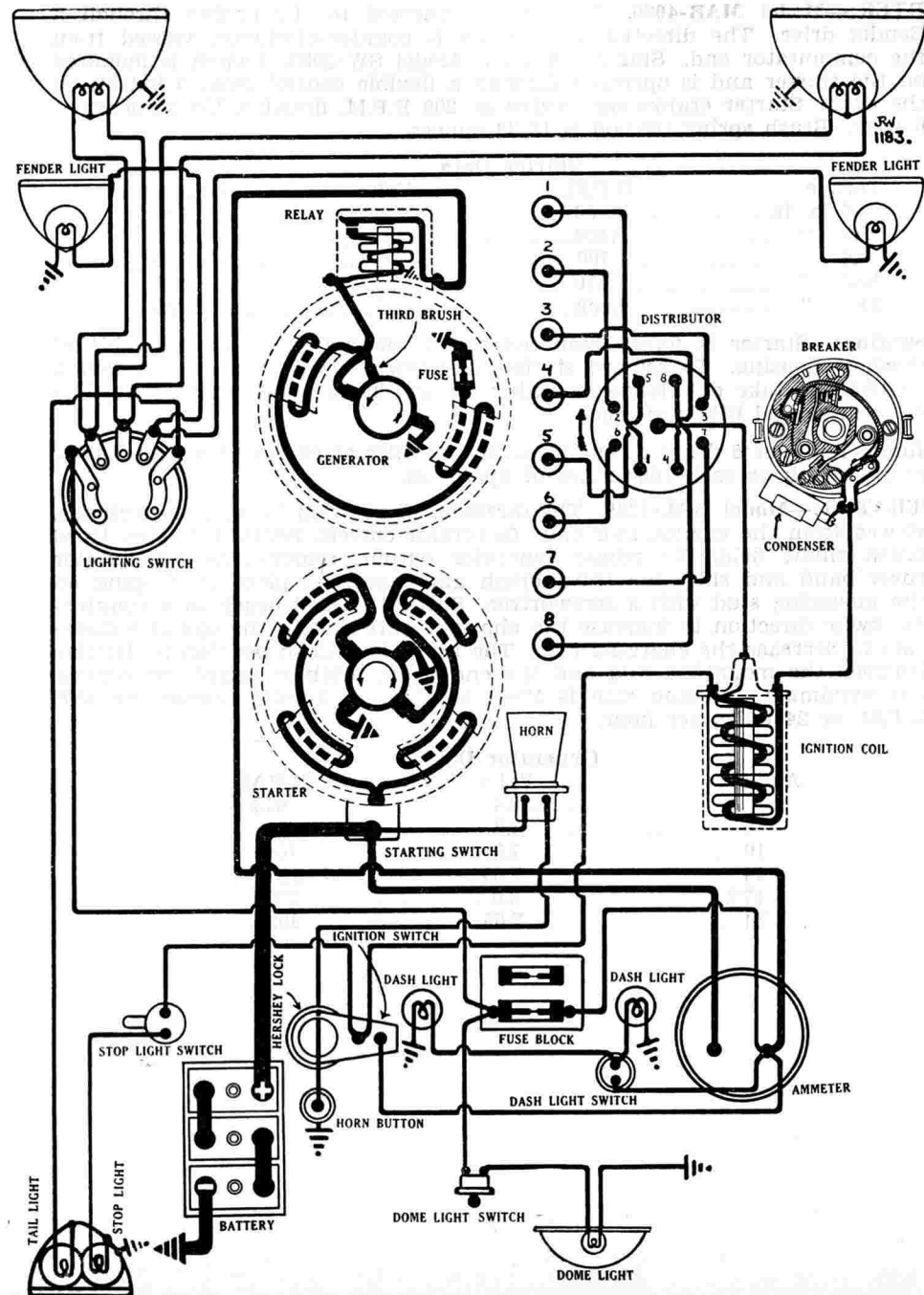
Mounting:—Distributor is mounted on top of the cylinder head and is driven through a bevel gear from the center of the camshaft. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then loosen set screw in side of cylinder head and lift distributor from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the shaft every 500 miles of operation. Remove the distributor head and rotor and put one drop of oil on the breaker pivot pins and 2 or 3 drops in the oiler in the center of the shaft. Every 5000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Auto-Lite Indicator and follow complete directions in Equipment Section. Synchronization should be checked whenever contacts are resurfaced or when ignition timing is checked. This is very important as it affects the timing of four cylinders.

Timing Distributor to Engine. Breaker contacts begin to open with No. 1 piston on compression stroke when the piston reaches a position before top dead center at which the first notch on the rim of the flywheel is directly opposite the indicator on the right motor support in the inspection hole at the right of the engine. This notch is before the notch indicating top dead center for cylinders Nos. 1 and 8. To set timing with crankshaft turned to position of No. 1 cylinder (as above), loosen the clamp screw on the side of the cylinder head and rotate the distributor housing until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1. The second set of contacts (mounted on the movable sub-plate) open exactly 45 degrees after this point.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.



NASH

EIGHT SERIES 8-70 (1931) SERIAL NUMBERS X-1001 UP PRODUCTION STARTED SEPTEMBER 1930 AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

Spark Plugs:—Spark plugs are 18 MM. Metric. A.C. Type G-14. Gaps are .018-.023 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1 13/32 inches. Stem diameter, .3095 inch. Stem length, 4 49/64 inches. Valve lift, 5/16 inch. Spring pressure, 45 pounds (valve closed), 75 pounds (valve open). Tappet clearance, .008 inch (hot). Inlet valves open 5 degrees after top dead center and close 45 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 11/32 inches. Stem diameter, .3095 inch. Stem length, 4 49/64 inches. Valve lift, 5/16 inch. Spring pressure, 45 pounds (valve closed), 75 pounds (valve open). Tappet clearance, .008 inch (hot). Exhaust valves open 45 degrees before lower dead center and close 5 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model MAB-4026. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter switch is Model SW-3080. Switch is mounted on the starter and is operated through a flexible control from a button on the dash. Starter cranks engine at 200 R.P.M. drawing 150 amperes at 6 volts. Brush spring tension is 18-36 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.	1900		100
3.5 "	1100		200
6.6 "	700		300
10.2 "	410		400
24 "	Lock		725

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect starting cable and switch control and take out flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of engine oil in the oiler at each end of the starter every month or each 1000 miles of operation.

GENERATOR:—Model GAL-4239. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush and mounting plate by tapping on the mounting stud with a screwdriver. Shift the third brush in a counter-

clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 17-18 amperes at 8 volts reached at 1800 R.P.M. or 24 miles per hour.

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	675
6	6.9	835
10	7.3	1025
14	7.65	1275
17.2	8.0	2075
14	7.65	2925

A 5 ampere field fuse is connected in the field circuit. Brush spring tension is 24-32 ounces. Generator motoring, draws 4.7-5.7 amperes at 6 volts. Shunt field current is 4.2 amperes at 6 volts.

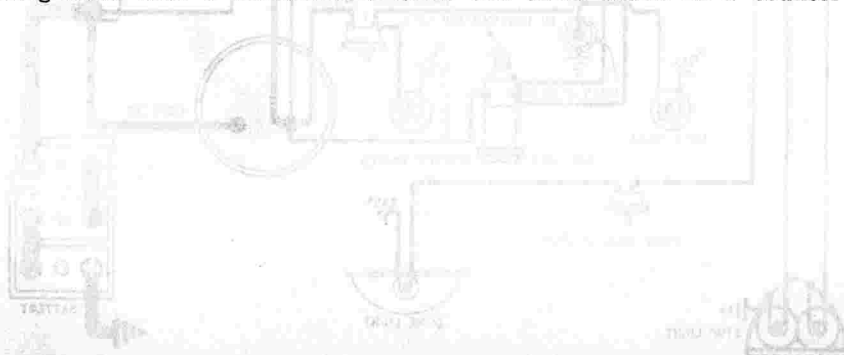
Mounting:—Generator is flange mounted at left of engine on rear face of front engine cross member. Generator is belt driven from the crankshaft. To remove generator, disconnect lead and take off drive pulley and belt. Free brace strap at rear of generator. Then take out flange mounting bolts and lift generator from place.

Oiling:—Put 4 or 5 drops of engine oil in each of the generator bearing oilers every two weeks or each 500 miles of operation.

RELAY:—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 9-9.5 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contacts separate .025-.035 inch. Air gap between relay armature and coil core is .010-.030 inch with contacts closed.

LIGHTING:—Soreng-Manegold Switch Model 4210-A. Lighting switch is mounted at the base of the steering column. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side, dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 4 cp. D.C.

FUSES:—Lighting fuse mounted on fuse block on the dash is 20 ampere capacity. Generator field fuse is 5 amperes capacity.



NASH

SERIES 8-80 (1931) SERIAL NUMBERS B-54928 UP
PRODUCTION STARTED SEPTEMBER 1, 1930
AUTO-LITE GENERATING, STARTING SYSTEM
AUTO-LITE IGNITION

BATTERY:—U.S.L., Type 3-HVX-6X-6A, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 127 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 23 hours. Battery is mounted under the left front seat.

IGNITION:—Coil Model CE-4001 (2 used). Ignition coils are mounted on the engine side of the dash at the right of the engine under the hood. Ignition current of each coil is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped. The ammeter will indicate the current drawn by both coils and should indicate an 8-10 ampere discharge with the ignition turned on whenever the engine is stopped with the breaker contacts closed. The ignition switch is a Delco-Remy Dual-lock, Model 425-P.

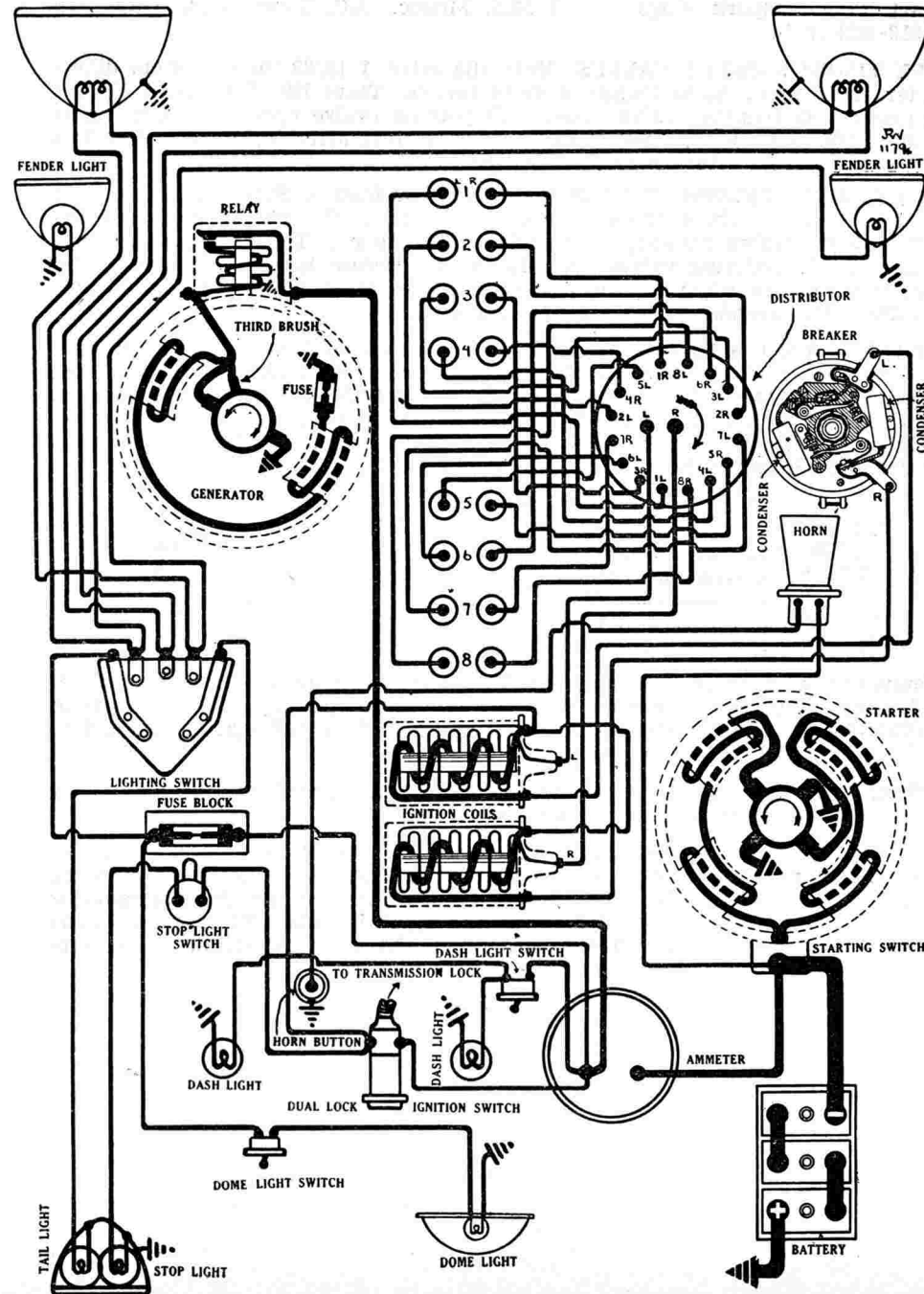
Distributor Model IKG-4003. Breaker contacts separate .020-.024 inch when new and .018-.020 inch after 1000 miles of use. Set contact gap (first set mounted on breaker plate) by loosening two lock screws on the stationary contact mounting plate and turning the eccentric adjusting screw. The second set of contacts (mounted on the movable sub-plate) are adjusted by loosening the lock nut on the stationary contact mounting stud and turning up the stud. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 20 ounces. Distributor is semi-automatic. Maximum manual advance is 38 degrees (engine). Automatic advance begins at 400 R.P.M. of the engine. Maximum automatic advance is 16 degrees reached at 2000 R.P.M. of the engine. Breaker has two sets of contacts operating on an eight sided cam. Contacts open simultaneously. Each set of contacts controls one coil and fires one set of spark plugs. The contacts must be synchronized to insure this simultaneous opening or the advantage of 'Twin Ignition' will not be secured. See Timing.

Mounting:—Distributor is mounted at the right of the engine and is driven through a spiral gear from the camshaft. To remove distributor, disconnect primary leads and manual spark control and remove distributor head with cables intact. Then take out two cap screws in distributor bracket and lift distributor from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor every 500 miles of operation. At the same time remove the distributor head and rotor and put one drop of oil on the breaker arm pivot pins and oil the wick oiler in the center of the shaft. Put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Contacts must be synchronized to secure simultaneous opening of both sets. Full directions on synchronization of IKG distributors will be found in the Equipment Section. Contacts may be synchronized as part of the timing operation. See next paragraph.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position 15 degrees (crankshaft) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control lever. Connect a six volt test lamp in series with each primary circuit to accurately determine when contacts open. Turn on ignition and continue to turn engine over until the mark 'IGN' on the front flywheel (which is 15 degrees before top dead center) is directly opposite the indicator on the crankcase. Then loosen the advance arm clamp screw and rotate distributor housing until the lamp goes out indicating that the first set of contacts has



NASH

SERIES 8-80 (1931) SERIAL NUMBERS B-54928 UP PRODUCTION STARTED SEPTEMBER 1, 1930 AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

opened. Tighten the clamp screw. If both lamps go out at the same instant, the contacts are properly synchronized. However if one lamp goes out first, it will be necessary to loosen the lock screws on the movable sub-plate and shift the plate until the second set of contacts (mounted on the sub-plate) open at the same instant. Connect the spark plugs as shown on the diagram.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 14 MM. Metric. A.C. Type K-12. Special Part No. 841980. Gaps are .020 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 21/32 inches. Stem diameter, .372 inch. Stem length, 5 1/2 inches. Valve lift, 11/32 inch. Tappet clearance, .012 inch (hot). Inlet valves open 15 degrees after top dead center and close 38 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 15/32 inches. Stem diameter, .372 inch. Stem length, 5 1/2 inches. Valve lift, 11/32 inch. Tappet clearance, .012 inch (hot). Exhaust valves open 45 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made. Valves should be adjusted with the motor running slowly.

STARTER:—**Model MAB-4033.** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. The starting switch is mounted on the starter field frame and is operated through a flexible control by a button on the dash. Brush spring tension is 28-36 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.	1900		100
3.5 "	1100		200
6.6 "	700		300
10.2 "	410		400
24 "	Lock		725

Mounting:—Starter is flange mounted at the right of the engine on the forward side of the flywheel housing. To remove starter, disconnect cables and starting switch control and take out flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the starter every 1000 miles of operation.

GENERATOR:—**Model GAR-4204.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, loosen the commutator cover band and shift the third brush mounting plate by prying on the mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 12-14 amperes (hot) at 8 volts reached at 1700 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	750
6	6.9	885
10	7.3	1030
14	7.65	1230
17	8.0	1700
14	7.65	2200

Brush spring tension is 24-32 ounces. Generator motoring, draws 3.5 amperes at 6 volts. Shunt field current is 2.5 amperes at 6 volts. A 5 ampere field fuse is connected in the field circuit.

Mounting:—Generator is cradle mounted at the left of the engine and is belt driven from the crankshaft. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling and loosen mounting clamp band. Slip off drive belt and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 500 miles of operation.

RELAY:—**Model CB-4014.** Relay is mounted on the generator. Relay contacts close at 725-750 R.P.M. when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—**Delco-Remy Switch Model 486-C.** Lighting switch is mounted at lower end of the steering column. Double filament-depressed beam headlight bulbs are used. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender, dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 4 cp. D.C.

FUSES:—Generator field fuse is 5 ampere capacity. Lighting fuse on fuse block on the engine side of the dash is 20 ampere capacity.

NASH

SERIES 8-90 (1931) SERIAL NUMBERS 509,201 UP
PRODUCTION STARTED SEPTEMBER 8, 1930
AUTO-LITE GENERATING, STARTING SYSTEM
AUTO-LITE IGNITION

BATTERY:—Exide, Type 3-LXC-17-1, 6 volt, 152 ampere hour. The positive (+) terminal is grounded. Battery is mounted under the left hand front seat.

IGNITION:—Coil Model CE-4001 (2 used). Coils are mounted on the engine side of the dash at the right of the engine under the hood. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped (for each coil). The ammeter will indicate the current drawn by both coils and should show an 8-10 ampere discharge whenever the engine is stopped with the contacts closed with ignition turned on. The ignition switch is a Delco-Remy Dual-lock.

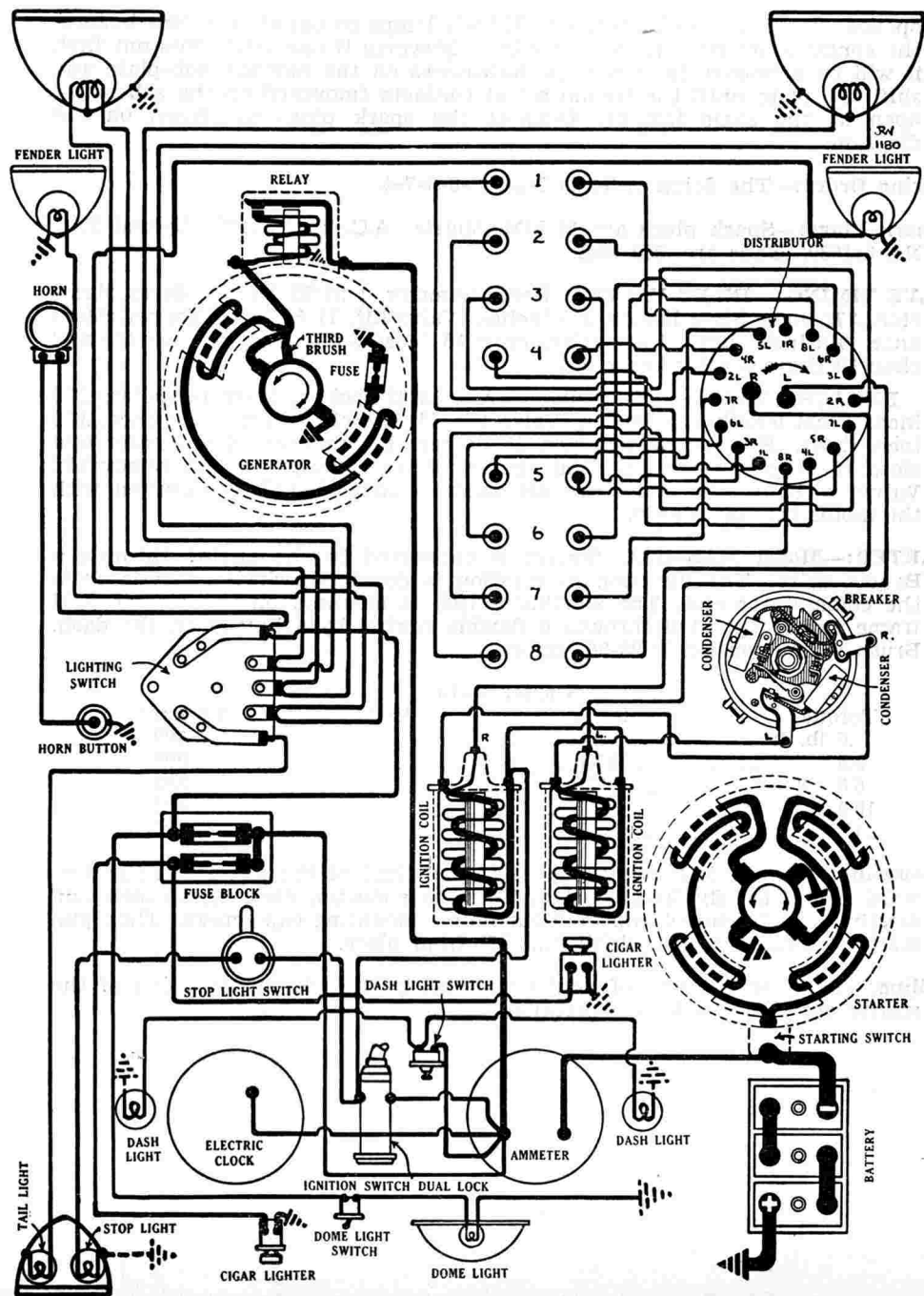
Distributor Model IGK-4001. Breaker contacts separate .020-.024 inch when new and .018-.020 inch after 1000 miles of operation. Set contact gap (first set of contacts mounted directly on the breaker plate) by loosening the two lock screws on the stationary contact mounting plate and turning up the eccentric adjusting screw. The second set of contacts (mounted on the movable sub-plate) are adjusted by loosening the lock nut on the stationary contact mounting stud and turning up the stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 20 ounces. Distributor is semi-automatic. Maximum manual advance is 38 degrees (engine). Automatic advance begins at 400 R.P.M. of the engine. Maximum automatic advance is 16 degrees reached at 2000 R.P.M. of the engine. Breaker has two sets of contacts operating on a single eight lobe cam. Each set of contacts controls one coil and fires one of the spark plugs in each cylinder. Contacts open simultaneously and this must be maintained by synchronizing contacts to secure full advantage of 'Twin Ignition.' See Timing.

Mounting:—Distributor is mounted at the right of the engine and is driven through spiral gears from the camshaft. To remove distributor, disconnect primary leads and manual spark control and remove distributor head with cables intact. Then take out two cap screws in distributor bracket and lift distributor from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor every 500 miles of operation. At the same time remove the distributor head and rotor and put one drop of oil on the breaker arm pivot pins and oil the wick oiler in the center of the shaft. Put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Contacts must be synchronized to secure simultaneous opening of both sets. Full directions on synchronization of IGK distributors will be found in the Equipment Section. Contacts may be synchronized as part of the timing operation. See next paragraph.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position 15 degrees (crankshaft) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (he up stroke with both valves closed). Fully advance the manual spark control lever. Connect a six volt test lamp in series with each primary circuit to accurately determine when contacts open. Turn on ignition and continue to turn engine over until the mark 'IGN' on the front flywheel (which is 15 degrees before top dead center) is directly opposite the indicator on the crankcase. Then loosen the advance arm clamp screw and rotate distributor housing until the lamp goes out, indicating that the first set of contacts has opened. Tighten the clamp screw. If both lamps go out at the same instant,



NASH

SERIES 8-90 (1931) SERIAL NUMBERS 509,201 UP PRODUCTION STARTED SEPTEMBER 8, 1930 AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

the contacts are properly synchronized. However if one lamp goes out first, it will be necessary to loosen the lock screws on the movable sub-plate and shift the plate until the second set of contacts (mounted on the sub-plate) open at the same instant. Connect the spark plugs as shown on the diagram.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 14 MM. Metric. A.C. Type K-12. Special Part No. 841608. Gaps are .019 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 11/16 inches. Stem diameter, 3/8 inch. Stem length, 5 17/32 inches. Valve lift, 11/32 inch. Spring pressure, 55-65 pounds (valve closed) and 139-149 pounds (valve open). Tappet clearance, .012 inch (hot). Inlet valves open 15 degrees after top dead center and close 38 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 17/32 inches. Stem diameter, 3/8 inch. Stem length, 5 17/32 inches. Valve lift, 11/32 inch. Spring pressure, 55-65 pounds (valve closed) and 139-149 pounds (valve open). Tappet clearance, .012 inch (hot). Exhaust valves open 45 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made. Valves should be adjusted with the engine running slowly.

STARTER:—**Model MAB-4024.** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. The starting switch is mounted on the starter field frame and is operated through a flexible control by a button on the dash. Brush spring tension is 28-36 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.	1900		100
3.5 "	1100		200
6.6 "	700		300
10.2 "	410		400
24 "	Lock		725

Mounting:—Starter is sleeve mounted at the right of the engine on the forward side of the flywheel housing. To remove starter, disconnect cables and starting switch control and take out large pilot mounting screw in housing directly above starter sleeve. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the starter every 1000 miles of operation.

GENERATOR:—**Model GAR-4204.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, loosen the commutator cover band and shift the third brush mounting plate by prying on the mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 14-18 amperes (hot) at 8 volts reached at 1700 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	750
6	6.9	885
10	7.3	1030
14	7.65	1230
17	8.0	1700
14	7.65	2200

Brush spring tension is 24-32 ounces. Generator motoring, draws 3.5 amperes at 6 volts. Shunt field current is 2.5 amperes at 6 volts. A 7.5 ampere field fuse is connected in the field circuit.

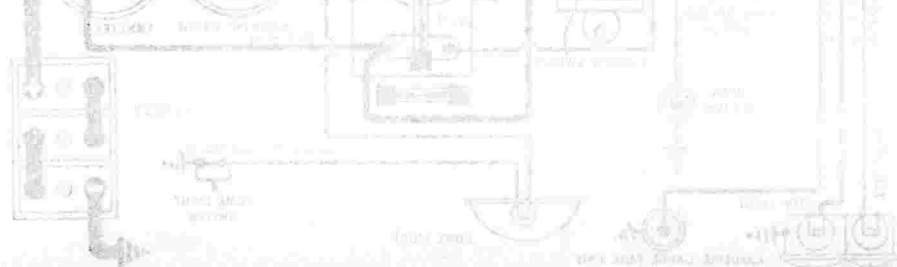
Mounting:—Generator is cradle mounted at the left of the engine and is belt driven from the crankshaft. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect lead and water pump drive coupling and loosen mounting clamp band. Slip off drive belt and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 500 miles of operation.

RELAY:—**Model CB-4014.** Relay is mounted on the generator. Relay contacts close at 725-750 R.P.M. when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—**Delco-Remy Switch Model 486-K.** Lighting switch is mounted at lower end of the steering column. Double filament-depressed beam headlight bulbs are used. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender, dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 4 cp. D.C.

FUSES:—Generator field fuse is 7.5 ampere capacity. Lighting fuse on fuse block on the engine side of the dash is 20 ampere capacity.



OAKLAND

MODEL 301 (1931) SERIAL NUMBERS 296,001 UP
PRODUCTION STARTED NOVEMBER 9, 1930
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

BATTERY:—Various batteries are used. These are 6 volt, 100 ampere hour. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 105 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on the right frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 526-R. The ignition switch is built in the base of the coil. Coil is mounted on the rear of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1.5 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped.

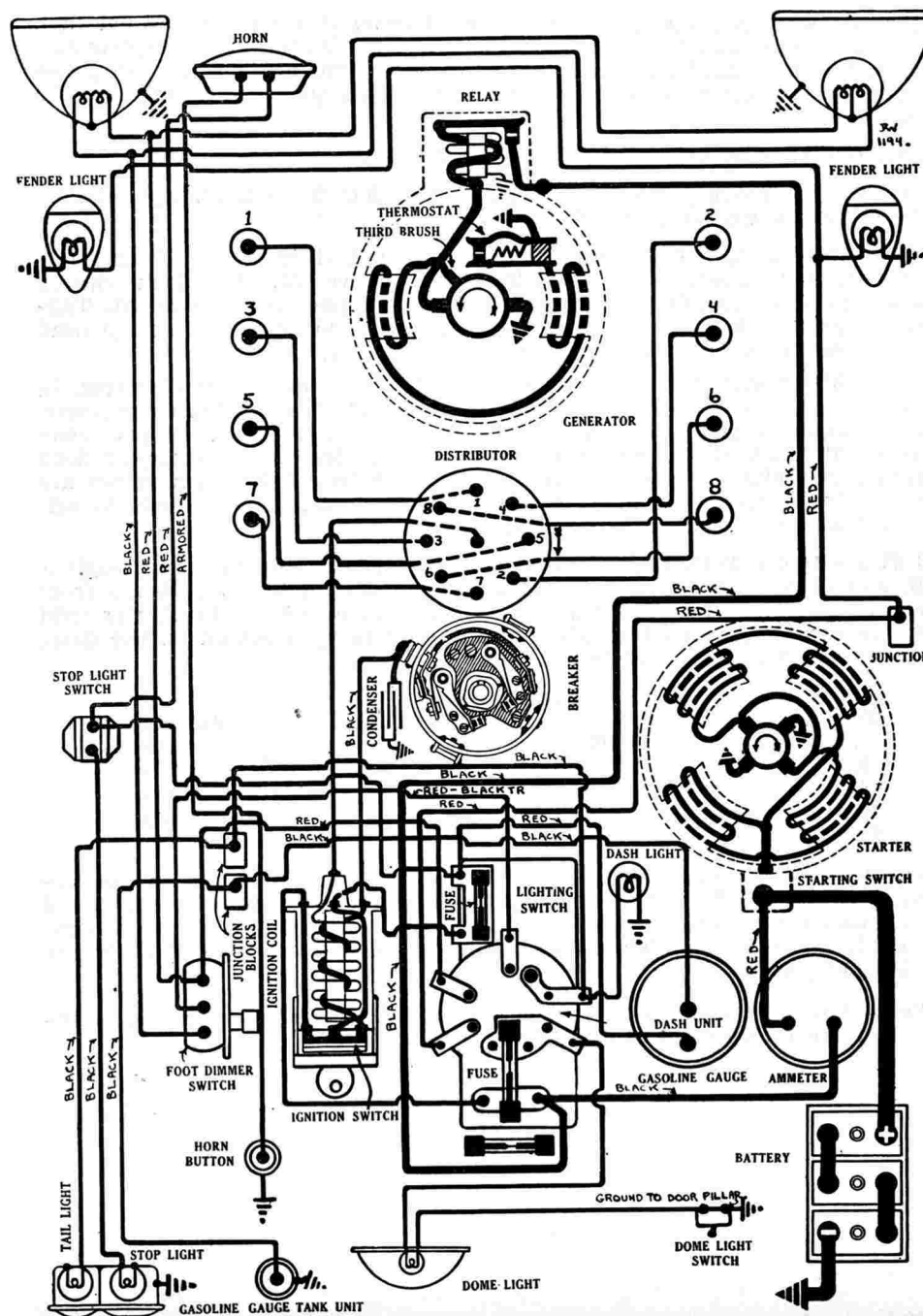
Distributor Model 661-B. Breaker contacts separate .016 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning eccentric adjusting screw until gap is .016 inch with breaker arm on lobe of cam. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. There are two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. The contacts must be synchronized to secure this firing interval for satisfactory engine performance. See Timing. Distributor is full automatic. Automatic advance begins at 700 R.P.M. of engine. Maximum automatic advance is 18-20 degrees reached at 2800 R.P.M. of the engine.

Mounting:—Distributor is mounted vertically at the rear of the engine between the cylinder banks. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then loosen advance arm clamp screw and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with No. 3 grease and turn down one turn every two weeks or each 500 miles. Every 1000 miles remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil and put a small bit of vaseline on the face of the breaker cam.

Timing:—**Synchronization of Contacts.** Contacts can be synchronized by using special Delco-Remy tool, Part No. 1838182, and following complete directions in the Equipment Section. It is possible to synchronize the contacts without special equipment after the distributor has been timed to the engine by cranking the engine over 270 degrees when piston No. 2 will reach firing position when the flywheel mark '2&8/IGN' will be directly opposite the indicator in the peephole in the flywheel housing at the left of the engine. Loosen the two lock screws on the movable breaker plate and turn the eccentric adjusting screw until the contacts begin to open. Tighten the lock screws and check the breaker gap with the breaker arm on the lobe of the cam.

Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches a position 10 degrees (on the flywheel) before top dead center. To set timing, crank engine over until No. 1 piston enters compression stroke (the up stroke with both valves closed). Turn engine over and stop when the flywheel mark '1&7/IGN' is directly opposite the indicator in the inspection hole in the left side of the flywheel housing (visible after taking up toeboard). This mark is 10 degrees before the top dead center mark 'DC/1-7'. Then loosen the advance arm clamp screw and rotate the distributor until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the clamp



OAKLAND

MODEL 301 (1931) SERIAL NUMBERS 296,001 UP
PRODUCTION STARTED NOVEMBER 9, 1930
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs as shown on the diagram. The second set of contacts (mounted on the movable breaker plate) open exactly 45 degrees after this point when piston No. 4 reaches firing position.

NOTE:—The upper clamp screw and indicator arm are used to make slight changes in the distributor setting. The normal setting is when the indicator is directly opposite the '0' mark on the scale. This is changed by loosening the clamp screw and shifting the arm.

Firing Order:—The firing order is 1-4-5-2-7-6-3-8 with cylinders numbered as shown on the diagram. This firing order is 1L-2R-3L-1R-4L-3R-2L-4R with cylinder No. 1 nearest the radiator and cylinder banks right and left as viewed from the driver's seat.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-12. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1½ inches. Stem diameter, 11/32 inch. Stem length, 5 13/16 inch. Valve lift, 5/16 inch. Spring pressure, 100 pounds. Tappet clearance, .011-.013 inch (hot). Inlet valves open at top dead center and close 40 degrees after lower dead center. The flywheel is marked at point of inlet opening for cylinders Nos. 1 and 2.

EXHAUST VALVES:—Head diameter, 1¾ inches. Stem diameter, 11/32 inch. Stem length, 5 13/16 inches. Valve lift, 5/16 inch. Spring pressure, 100 pounds. Tappet clearance, .011-.013 (hot). Exhaust valves open 45 degrees before lower dead center and close 15 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model 726-H (726-J—R.H. Drive). Starter is connected to the engine through a Dyer manual pinion shift. The first movement of the starting pedal compresses two coil springs within a sleeve. These springs force the starter drive pinion in mesh with the engine flywheel gear. The further movement of the starting pedal closes the starting switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	65
15 "	Lock	3.15	570

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and remove starting pedal control rod. Then take out two flange mounting cap screws and nut on flange bolt. Pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the starter bearing oiler every month or each 1000 miles.

GENERATOR:—Model 959-J. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 9-12 amperes (hot) reached at 1800-2000 R.P.M.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
18-20	8.0	1450	9-12	7.35-7.65	1800-2000

Brush spring tension is 14-18 ounces. Shunt field current is 4-6.1 amperes. Generator motoring draws 5.5-6 amperes at 6 volts.

Mounting:—Generator is flange mounted at front of engine between cylinder banks and is driven by the fan belt. To remove generator, disconnect lead and remove three flange mounting cap screws. Then lower generator and slip off drive belt. The generator and fan can then be lifted from place.

Belt Adjustment. The generator drive belt tension is adjusted by shifting the generator. To take up drive belt, loosen the two flange mounting screws and tilt the generator to the left around the left hand screw as a pivot. Tighten the mounting screws. The belt tension should be just sufficient to drive the generator and fan without slipping.

Oiling:—Put 8 or 10 drops of light engine oil in each of the generator bearing oilers every month or each 1000 miles of operation.

RELAY:—Model 265-G. Relay is mounted on the generator. Relay contacts close when the generator voltage reach 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—Clum Switch Model 9191. Lighting switch is mounted on the instrument panel. Double filament headlights using a second 21 cp. filament instead of dimmers are standard equipment. Headlights are controlled by a dimmer switch mounted on the toeboard. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash, tail and dome lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

Dimmer switch is Delco-Remy Model 465-J.

FUSES:—Lighting fuse mounted on back of switch is 20 ampere capacity. A spare fuse is mounted on the switch. The small fuse at the top of the switch (in the gasoline gauge circuit) is 3 ampere capacity.

MODEL F-31 (1931)
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

IGNITION:—Coil Model 533-U. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is .5-2.5 amperes at 6 volts with engine running and 4.5 amperes at 6 volts with engine stopped.

Distributor Model 639-G. Breaker contacts separate .022 inch. Set contact gap by loosening lock screw on crescent shaped stationary contact mounting plate and turning eccentric adjusting screw until correct gap is obtained with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is full automatic. Automatic advance begins at 400 R.P.M. (engine). Maximum automatic advance is 22 degrees reached at 2600R.P.M.

Oiling:—Fill the grease cup on the side of the shaft and turn down one half turn every two weeks or each 500 miles. At the same time, remove the distributor head and rotor and saturate the wick oiler in the center of the shaft with light engine oil and put a small amount of vaseline on the face of the breaker cam.

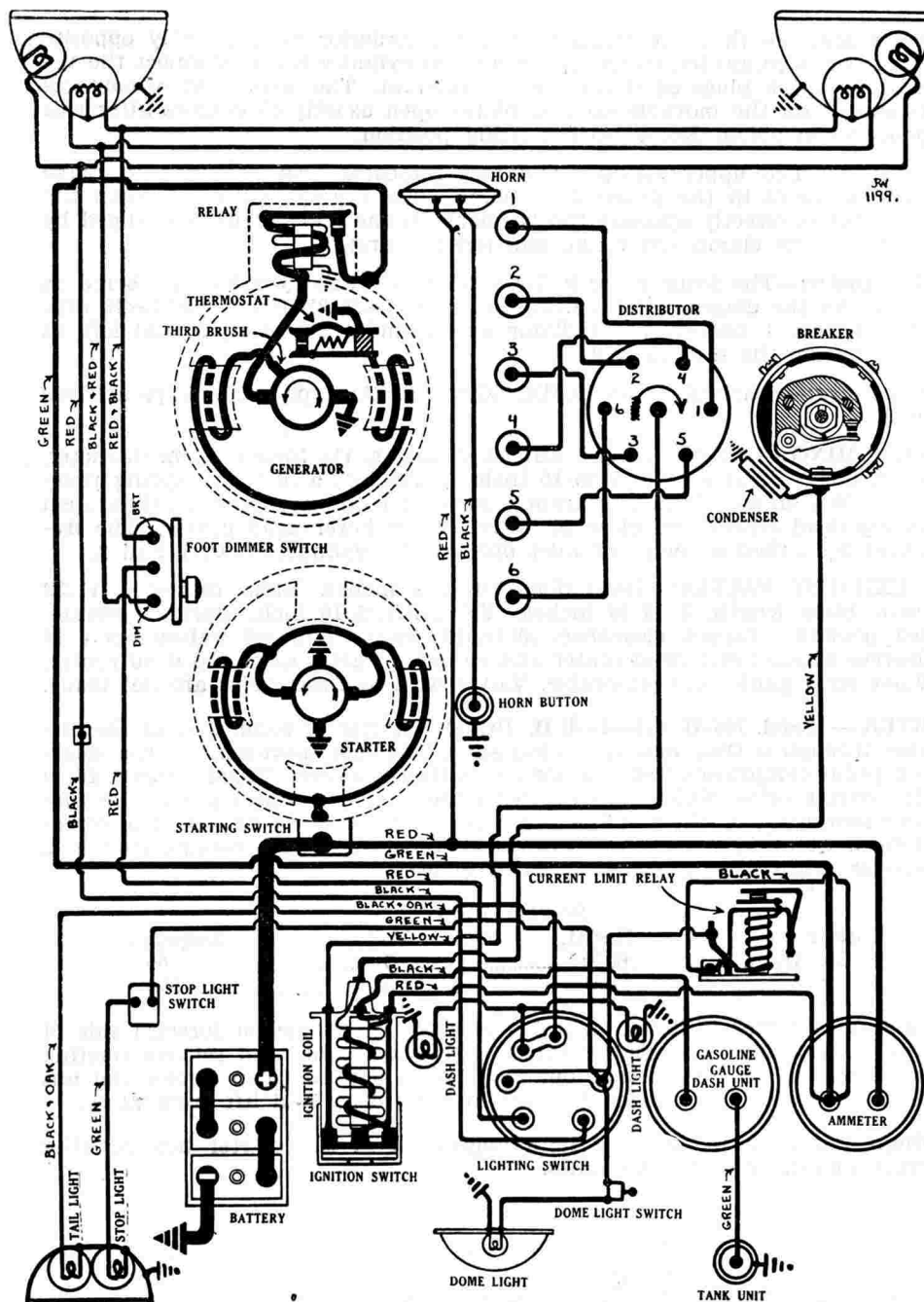
Timing:—Breaker contacts begin to separate when the piston entering power reaches top dead center with breaker assembly in the fully retarded position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Continue to crank engine until piston reaches firing position when the flywheel mark '0' will be in line with the indicator in the peephole in the front of the flywheel housing on the left of the engine. Loosen advance arm clamp screw and rotate distributor until contacts begin to separate. Tighten the clamp screw and connect the segment opposite the rotor to the spark plug in cylinder No. 1. Connect the remaining spark plugs in order 5-3-6-2-4 clockwise around the distributor.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are Metric A.C. Type G-12. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES:—Head diameter, 1 17/32 inches. Stem diameter, 11/32 inch. Stem length, 5 3/8 inches (over all). Valve lift (with .010 inch lash), .320 inch. Spring pressure, 40 pounds (spring length, 2 1/4 inches) and 87 pounds (spring length, 1 15/16 inches). Tappet clearance, .007-.009 inch (hot) running and .010 inch when setting camshaft. Inlet valves open at top dead center (with .010 inch clearance) and close 50 degrees after lower dead center. The flywheel is marked '0' at the top dead center position.

EXHAUST VALVES:—Head diameter, 1 13/32 inches. Stem diameter, 3/8 inch. Stem length, 5 3/8 inches (over all). Valve lift, .320 inch. Spring pressure, 40 pounds (spring length, 2 1/4 inches) and 87 pounds (spring length, 1 15/16 inches). Tappet clearance, .009-.011 inch (hot). Exhaust



OLDSMOBILE

MODEL F-31 (1931) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

valves open 40 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Oversize valves are not made.

STARTER:—Model 714-H. Starter is connected to the engine through a manual pinion shift interconnected with the starting switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter cranks the engine at 125 R.P.M. drawing 130 amperes at 5.5 volts. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5	65
12 "	Lock	3.63	475

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and remove starter pedal link pin. Then remove flange mounting cap screws, pull starter forward and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles. The drive end bearing is oilless.

GENERATOR:—Model 955-R. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 170°F. cutting the resistance across the thermostat contacts in series with the field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, maximum charging rate is 9-12 amperes (hot) reached at 2000 R.P.M. of the generator.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.35-8.5	1450	9-12	7.35-7.65	1800-2000

Motoring, generator draws 5.5 amperes at 6 volts. Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted on pivot mounting bracket at the left of the engine and is driven by the fan belt. To remove generator, disconnect lead and loosen pivot bolt. Swing generator toward engine and slip off drive belt. Then take out pivot bolt and lift generator from place.

Belt Adjustment. To take up drive belt, loosen pivot bolt and swing generator away from the engine. Tighten pivot bolt. The belt should be just tight enough to drive the generator and fan shaft without slipping.

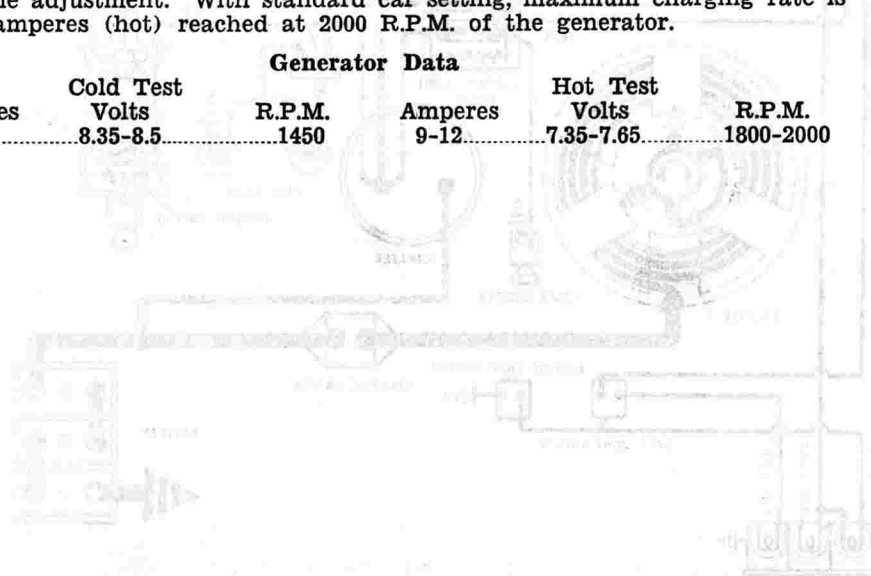
Oiling:—Put 8 or 10 drops of light engine oil in the generator oilers every two weeks or each 500 miles of operation.

RELAY:—Model 265-G. Relay is mounted on the generator. Relay contacts close at 650 R.P.M. or 12 M.P.H. when the generator voltage reaches 6.75-7.5 volts and open at 575 R.P.M. or 9.5 M.P.H. with a discharge current of 1-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 478-F. Lighting switch is mounted at the lower end of the steering column. Double filament headlights are used instead of dimming. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights (in headlights) are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash, tail and dome lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

Dimmer switch mounted on toe board is Delco-Remy Model 465-J. Stop light switch is Model 466-A.

CURRENT LIMIT RELAY:—Model 410-C. This device is a vibrating circuit breaker mounted on the dash and connected in the lighting circuits. It begins to vibrate when the current reaches 25-30 amperes and continues limiting the current to 2-15 amperes. Contact gap is .012-.030 inch. Air gap is .015-.025 inch.



PACKARD

MODELS 726, 733 AND 740, 745 (1930)

OWEN-DYNETO GENERATING, STARTING SYSTEM NORTH EAST IGNITION

BATTERY:—(726, 733) Prest-O-Lite, Type A-615-SF, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 148.4 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 26.6 hours. Battery is mounted on the right frame member.

(740, 745) Prest-O-Lite, Type A-617-SF, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 169.6 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 32.2 hours.

IGNITION:—Coil Type 5022293. The ignition switch is built in the base of the coil. Coil is mounted on the back of the dash with the ignition switch extending through to the face of the instrument panel. The ignition current is 2.75 amperes at 6 volts with engine running at 400 R.P.M. decreasing to .8 amperes at 4000 R.P.M. Ignition current is 4.75 amperes at 6 volts with engine stopped.

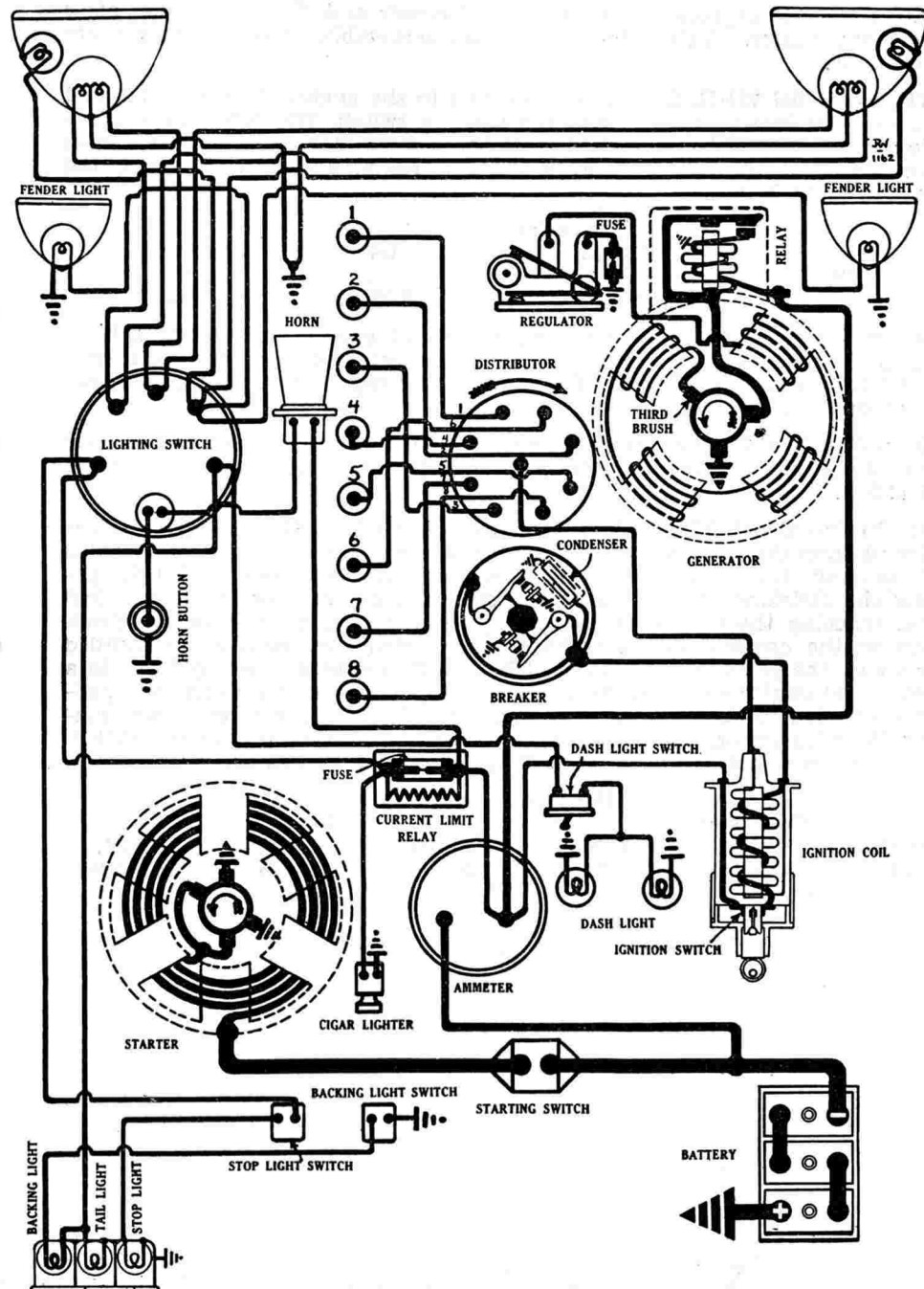
Distributor Type 5010896. Breaker contact gap should be .020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up the stud. Resurface contacts when necessary on a medium hard oilstone or use a fine flat contact file. Breaker arm spring tension is 16 ounces. Distributor is semi-automatic. Maximum manual advance is 40 degrees (engine). Automatic advance begins at 600 R.P.M. of the engine. Maximum automatic advance is 16 degrees reached at 3000 R.P.M. Breaker has two sets of contacts operating on a single eight lobe cam. Breaker contacts should open simultaneously and the breaker gap must be held at .020 inch for both sets of contacts to insure the simultaneous opening.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take out two hold-down screws and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down one turn every 1000 miles of operation. At the same time remove the distributor head and rotor and put one drop of oil on the breaker arm pivot pins and place a small bit of grease on the face of the breaker cam.

TIMING:—Breaker contacts begin to open when the piston entering power stroke reaches a position 29/32 inch before top dead center (measured on the flywheel) with the manual spark control button in the fully advanced position (pushed all the way in toward the dash). To set timing, turn engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control. Turn the engine over until piston reaches firing position when the ignition mark on the flywheel (which is 29/32 inch before the top dead center mark for cylinders 1 and 8) will be directly opposite the indicator on the flywheel housing. Then loosen the advance arm clamp screw and rotate the distributor until both sets of contacts begin to open. Tighten the clamp screw and see that the segment in the distributor head opposite the rotor is connected to the spark plug in cylinder No. 1.

Synchronization of Contacts. Contacts should be synchronized whenever ignition timing is checked or contact adjustment is changed. Use test lamps connected across each set of contacts to accurately determine when contacts open. The breaker plate is so constructed that it is movable after the locking screw on the movable plate has been loosened. To synchronize contacts, loosen the locking screw and insert a screwdriver in the slot in the plate. Then shift the plate by turning the screwdriver until both



P A C K A R D

MODELS 726, 733 AND 740, 745 (1930)

OWEN-DYNETO GENERATING, STARTING SYSTEM NORTH EAST IGNITION

contacts open at the same instant. The movable plate turns on two small pins punched in the plate underneath. Tighten the lock screw after making the adjustment.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Long. Gaps are .025 inch.

VALVE TIMING:—Specifications. Head diameter of inlet valves is 1 $\frac{21}{32}$ inches (726, 33) and 1 $\frac{13}{16}$ inches (740, 45). Stem diameter is .3405 inch. Head diameter of exhaust valves is 1 $\frac{15}{32}$ inches (726, 33) and 1 $\frac{11}{16}$ inches (740, 45). Tappet clearance on both inlet and exhaust valves is .004 inch (hot).

Timing:—Inlet valves open 20 degrees or $6\frac{1}{2}$ teeth on the flywheel before top dead center. Exhaust valves close 20 degrees after top dead center.

STARTER:—Model DI-850 (726, 33) DN-860 (740, 45). The starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 26-28 ounces. The starter is a six pole motor with a single field coil which is so constructed that it winds around three sides of each field pole. There are four main brushes (two field lead brushes and two ground brushes, each connected in parallel).

Model DI-850 Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4500	6	60
25 "	Lock	3.5	650

Model DN-860 Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	6	50
35 "	Lock	3.5	650

Mounting:—Starter is sleeve mounted at the left of the engine on the forward face of the flywheel housing. To remove starter, disconnect cable and take out large pilot mounting screw in flywheel housing directly above starter sleeve. Then pull starter forward to clear Bendix and lift from place.

Oiling:—Starter is equipped with oilless bronze bearings. They require no attention.

GENERATOR:—Model CD-865. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field operating in conjunction with a 'Battery Charge Regulator'. To adjust the charging rate, remove the commutator cover and turn the slotted adjustment screw on the end plate. This shifts the third brush through a rack-and-pinion engagement. Turn the screw in a clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The Battery Charge Regulator consists of an electrically operated thermostat which cuts a resistance in the field circuit when the thermostat blade opens. This permits a relatively high charging

rate while the battery is protected against overcharging. The thermostat is compensated for temperature changes and is entirely automatic. It requires no service adjustments.

Generator Data		
Amperes	Volts	R.P.M.
0	6.4	600
16-18	8.0	1400
7	7.0	3500

Motoring, generator draws 7 amperes at 6 volts. Shunt field current is 4 amperes at 6 volts. Brush spring tension is 3 pounds. A five ampere field fuse is mounted under the regulator cover. The field is grounded through this fuse.

Mounting:—Generator is flange mounted at the right of the engine on the rear of the timing chain case. To remove generator, disconnect lead and remove three flange mounting cap screws. Then pry generator to the rear without disturbing the plate between the generator flange and chain case which carries the drive sprocket and generator bearing. Since the drive end bearing of the generator is in the engine, the generator cannot be run on the test bench unless a special test bearing is bolted in place. This can be secured from the Owen-Dyneto Corporation and is their part No. 22196. Do not crank the engine with the generator out of the engine.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the commutator end of the generator every month or each 1000 miles of operation. The drive end bearing is oiled from the chain case.

BATTERY CHARGE REGULATOR AND CUTOUT:—Model 20220. The regulator and relay cutout are mounted in a single case on the generator field frame. Relay contacts close at 600 R.P.M. of the generator when the voltage reaches 6.4 volts and open with a discharge current of 0-2 amperes. Relay contact gap should be .015 inch. Air gap is .010 inch with contacts closed. The regulator consists of a fixed resistance wound on a spool and connected across the contacts of a specially compensated thermostat. One thermostat terminal is connected to the shunt field terminal of the generator and the other terminal is grounded through a 5 ampere field fuse. The thermostat is actuated by a fine resistance winding connected directly across the generator. When the thermostat contacts open the fixed resistance is cut in series with the shunt field. The regulator is adjusted by increasing or decreasing the spring tension of the thermostat arm. Increasing the spring tension will increase the operating voltage.

LIGHTING:—Lighting switch is mounted at the base of the steering column. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights (in headlights) or fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing lights are each 6-8 volt, 21 cp. S.C. Mazda 1129. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Generator field fuse is 5 ampere capacity. Lighting fuse mounted on fuse block on the dash is 20 ampere capacity.

PACKARD

MODELS 826, 833 AND 840, 845 (1930)

OWEN-DYNETO GENERATING, STARTING SYSTEM NORTH EAST IGNITION

BATTERY:—Prest-O-Lite, Type A-617-S, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 169.6 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 32.2 hours. Battery is mounted on the right frame member under the right hand dust shield.

IGNITION:—Coil Type 5025430. The ignition switch is built in the base of the coil. The coil is mounted on the back of the dash with the ignition switch extending through to the face of the instrument panel. Ignition current with engine running is 2.75 amperes at 6 volts at 400 R.P.M., gradually decreasing to .8 amperes at 4000 R.P.M. With engine stopped ignition current is 4.75 amperes at 6 volts. The coil has an extra terminal from which a lead is taken for the fuel pump when the electric fuel pump is installed.

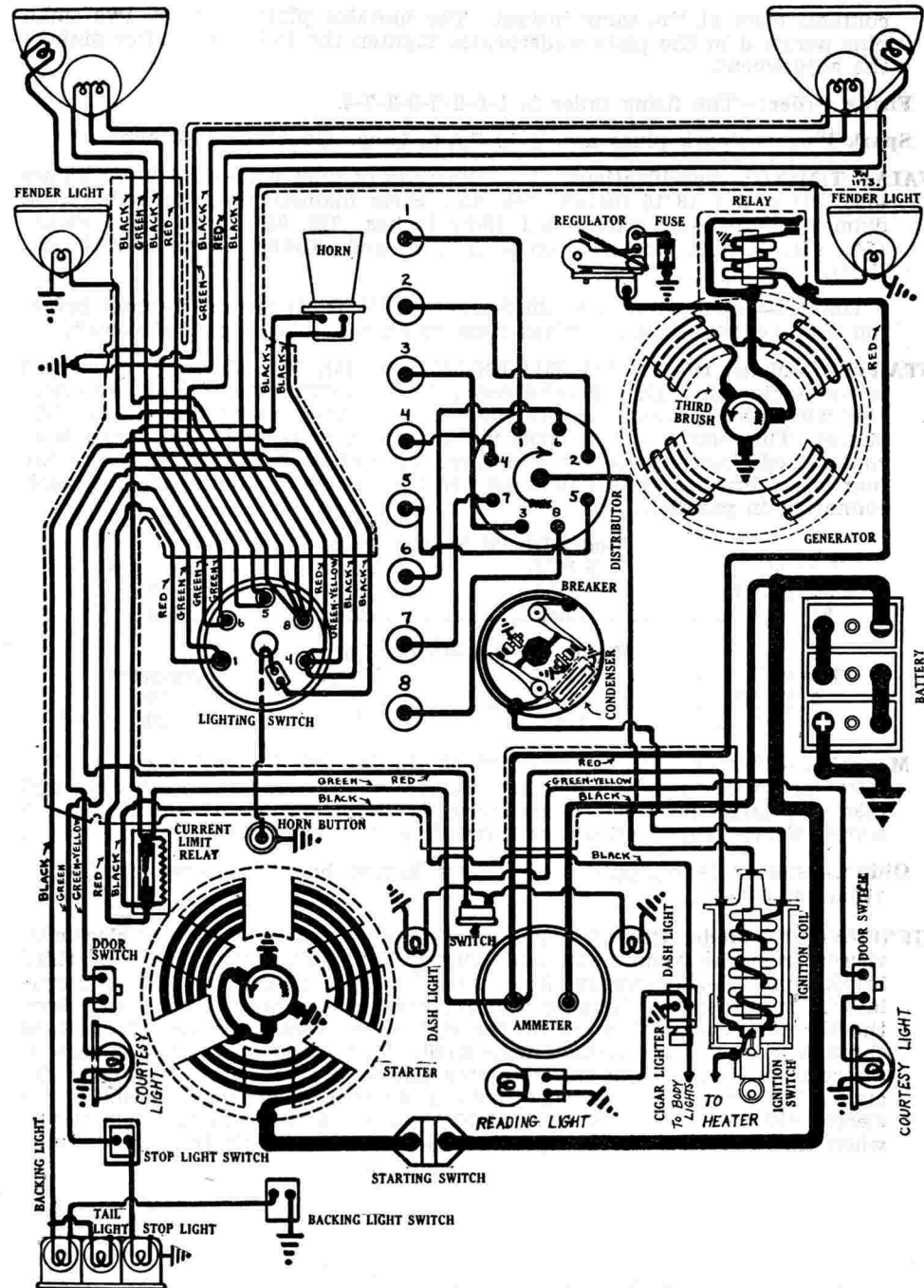
Distributor Type 5010896. Breaker contact should be .020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up the stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension should be 16 ounces. Distributor is semi-automatic. Maximum manual advance is 40 degrees (engine). Automatic advance begins at 400 R.P.M. of the engine. Maximum automatic advance is 16 degrees reached at 3000 R.P.M. Breaker has two sets of contacts operating on an eight lobe cam. Contacts open simultaneously and are connected in parallel in the primary circuit of the ignition coil. The contact gap of .020 inch must be set very exactly to maintain this simultaneous opening.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out two hold-down screws in the distributor mounting and lift the distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down one turn every month or each 1000 miles of operation. At the same time remove the distributor head and rotor and put a drop of oil on the breaker arm pivot pins and place a small bit of vaseline or grease on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position 29/32 inch before top dead center (measured on the flywheel) with the manual spark control fully advanced (spark control button pushed all the way in toward the dash). To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control and turn the engine over until the ignition mark on the flywheel, which is 29/32 inch before the top dead center mark for cylinders Nos. 1 and 8, is directly opposite the indicator on the flywheel housing. Then loosen the advance arm clamp screw and rotate the distributor until both sets of contacts begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1.

Synchronization of Contacts. Contacts should be synchronized whenever ignition timing is checked or contact adjustment is changed. Use test lamps connected across each set of contacts to accurately determine when contacts open. The breaker plate is so constructed that it can be moved on the lower plate around two pins punched in the plate after the locking screw which holds it in position has been loosened. To synchronize contacts, loosen the locking screw and insert a screwdriver in the slot in the movable plate. Shift the plate by turning the screwdriver until both contacts open at the same instant. Tighten the lock screw after making the adjustment.



PACKARD

MODELS 826, 833 AND 840, 845 (1930)

OWEN-DYNETO GENERATING, STARTING SYSTEM NORTH EAST IGNITION

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Gaps should be .025 inch.

VALVE TIMING:—Specifications. Head diameter of inlet valves is 1 $\frac{21}{32}$ inches (826, 33) and 1 $\frac{13}{16}$ inches (849, 45). Stem diameter is .3405 inch. Head diameter of exhaust valves is 1 $\frac{15}{32}$ inches (826, 33) and 1 $\frac{11}{16}$ inches (840, 45). Stem diameter is .3405 inch. Tappet clearance is .004 inch (hot).

Timing:—Inlet valves open 20 degrees before top dead center and the exhaust valves close 20 degrees after top dead center.

STARTER:—Model DI-850 (826, 833) DM-693 (840, 845). Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 26-28 ounces. The starter is a six pole series motor with a single field coil which is so constructed that it winds around three sides of each field pole. There are four main brushes (two field lead brushes and two ground brushes, each connected in parallel).

Model DI-850 Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4500	6	60
25 "	Lock	3.5	650
Model DM-693 Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	3000	6	50
35 "	Lock	3.5	650

Mounting:—Starter is sleeve mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect cable and take out large pilot mounting screw in flywheel case directly above the starter sleeve. Pull starter forward to clear Bendix and lift from place.

Oiling:—Starter is equipped with oilless bronze bearings. They require no attention.

GENERATOR:—Model CL-896. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field in conjunction with a 'Battery Charge Regulator'. To adjust the charging rate, remove the commutator cover and turn the slotted adjustment screw on the end plate. This shifts the third brush through a rack and pinion engagement. Turn the adjustment screw in a clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The Battery Charge Regulator consists of an electrically operated thermostat which cuts the resistance in the field circuit when the thermostat blade opens the regulator contacts. This permits a relatively high charging rate and at the same time protects the battery against overcharging. The thermostat is compensated for temperature changes and requires no service adjustments.

Generator Data		
Amperes	Volts	R.P.M.
0	6.2	480
8	7.0	680
18	8.1	1300
12	7.4	4000

A five ampere field fuse is mounted under the regulator cover on the generator. The shunt field is grounded through this fuse.

Mounting:—Generator is flange mounted at the right of the engine on the rear of the timing chain case. To remove generator, disconnect lead and take out three flange mounting cap screws. Then pull the generator to the rear without disturbing the intermediate flange which carries the generator bearing and drive sprocket. The drive end bearing is mounted in the engine and the generator can not be driven on the test bench unless a special test bearing is bolted in place. This is furnished by the Owen-Dyneto Corporation and is their part No. 22196. Do not attempt to crank the engine with the generator out.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler on the commutator end of the generator every month or each 1000 miles of operation. The drive end bearing is oiled from the chain case.

BATTERY CHARGE REGULATOR AND RELAY:—Model 20530. The Battery Charge Regulator and relay cut-out are mounted on the generator field frame in a single case. The relay contacts close at 480 R.P.M. when the generator voltage reaches 6.2 volts and open with a discharge current of 0-2 amperes. Relay contact gap is .015 inch. Air gap should be .010 inch with contacts closed. The regulator consists of a fixed field resistance connected across the contacts of the thermostat blade. This resistance is cut in series with the shunt field when the thermostat contacts open. The thermostat is actuated by a fine resistance wound on the thermostat blade which is connected across the generator. The regulator is adjusted by increasing or decreasing the spring tension on the thermostat arm by turning the small screw under the lower blade. Increasing the spring tension will increase the operating voltage.

LIGHTING:—Lighting switch is mounted at the lower end of the steering column. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Auxiliary headlights (in headlights) and fender lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing lights are 6-8 volt, 21 cp. S.C. Mazda 1129. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Generator field fuse is 5 ampere capacity. Lighting fuse mounted on the fuse block on the dash is 20 ampere capacity.

PEERLESS

MODEL 6-61-A (1930)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—U.S.L., Type 3-HVX-5X-6A, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 106 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 18 hours. Battery is mounted on the left frame member under the front compartment floor boards.

IGNITION:—Coil Model 528-C. Coil is mounted on the dash. Ignition current is 1.8 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped. The ignition switch is a Type 5-B Electrolock.

Distributor Model 631-F. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on crescent shaped stationary contact arm and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 28 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 24 degrees (engine) reached at 3200 R.P.M.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual advance control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor and Electrolock from place as a single unit. See Equipment Section for complete description of Electrolock and directions on removing Electrolock from distributor.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium grease and turn down one turn every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and rotor and fill the wick oiler in the center of the shaft with light engine oil and put one drop of oil on the breaker arm pivot pin. Put a small bit of vaseline on the face of the breaker cam.

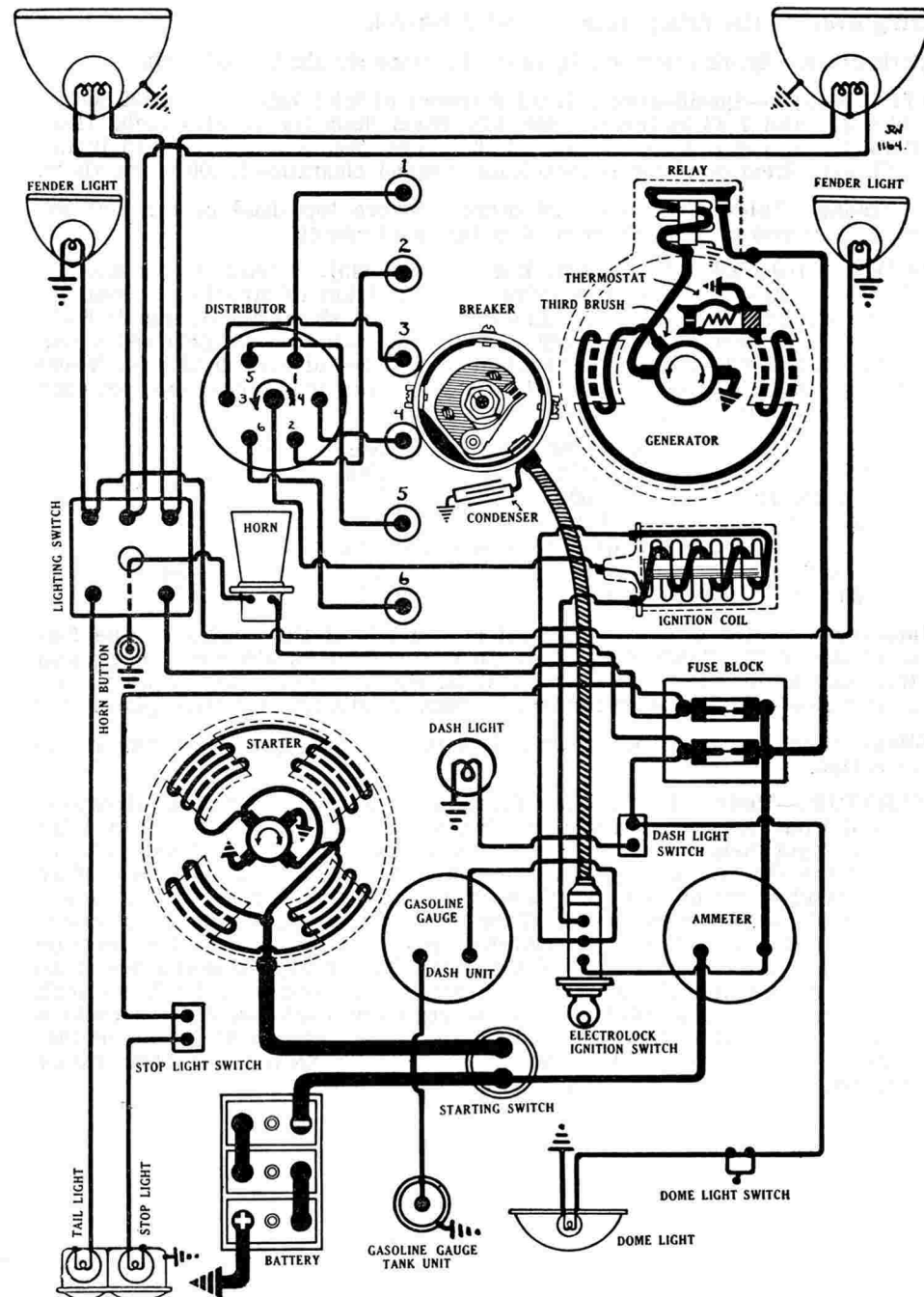
Timing:—Breaker contacts begin to separate when the piston entering power stroke reaches a position 10 degrees before top dead center when the flywheel mark 'IGN' will be directly opposite the indicator on the flywheel case with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance manual spark control and turn engine over until flywheel mark 'IGN' is directly opposite indicator mark on housing. Then loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and see that rotor is directly opposite the segment connected to the spark plug in cylinder No. 1 (see diagram).

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Std. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1 $\frac{9}{16}$ inches. Stem diameter, 11/32 inch. Stem length, 4 $\frac{29}{32}$ inches. Valve lift, 5/16 inch. Spring pressure, 103 pounds (spring compressed to 2 inches). Tappet clearance, .006 inch (hot). Inlet valves open 5 degrees after top dead center and close 45 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 $\frac{7}{16}$ inches. Stem diameter, 11/32 inch. Stem length, 4 $\frac{29}{32}$ inches. Valve lift, 5/16 inch. Spring pressure, 103 pounds (spring compressed to 2 inches). Tappet clearance, .008 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 5 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.



PEERLESS

(1931) MODEL 6-61-A (1930) DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

STARTER:—Model 718-H. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces. Starter switch is Model 406-K.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.....	6000.....	5.....	65
15 ".....	Lock.....	3.15.....	570

Mounting:—Starter is flange mounted at left of engine on forward side of fly-wheel case. To remove starter, disconnect cable and remove three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles of operation. The drive end bearing is oilless.

GENERATOR:—Model 949-V. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance across the contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, loosen the small round headed screw on the generator end plate (commutator end) and remove the commutator cover band. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to reduce the charging rate. Tighten the screw after making the adjustment.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
21.....	8.35-8.5.....	1450	9-12.....	7.35-7.65.....	1800-2000

Brush spring tension is 14-18 ounces. Generator, motoring, draws 5.5 amperes at 6 volts. Shunt field current is 4-6.1 amperes at 6 volts.

Mounting:—Generator is flange mounted at the right of the engine on the rear of the timing chain case and is driven by the timing chain. To remove generator, disconnect lead and remove cover on front face of chain case. This removable plate is directly over the generator drive sprocket. Then remove cotter pin and nut on the end of the generator shaft. Take out flange mounting screws and pull generator to the rear leaving the generator drive sprocket in the engine. Tie up the sprocket and do not attempt to crank engine with generator out.

Timing Chain Adjustment. Timing chain is adjusted by shifting the generator. To take up timing chain, loosen the mounting cap screws and pry the generator to the right, away from the engine, until the chain hums with the engine running. Then back off generator until chain runs noiselessly and tighten mounting screws.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the generator every month or each 1000 miles. The drive end bearing is oiled by splash from the chain case.

RELAY:—Model 265-G. Relay is mounted on the generator. Relay contacts close when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contacts separate .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Soreng-Manegold Switch. Lighting switch is mounted at the lower end of the steering column. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Side, dash, tail and dome lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Lighting fuses mounted on fuse block on dash are 20 ampere capacity.

PEERLESS

STANDARD EIGHT MODEL A (1931)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—Willard, Type WSB-15, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 105 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 20 hours. Battery is mounted on left frame member under the floor boards of the front compartment.

IGNITION:—Coil Model CE-4302. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1.5 amperes at 6 volts with engine running and 4.5 amperes at 6 volts with engine stopped.

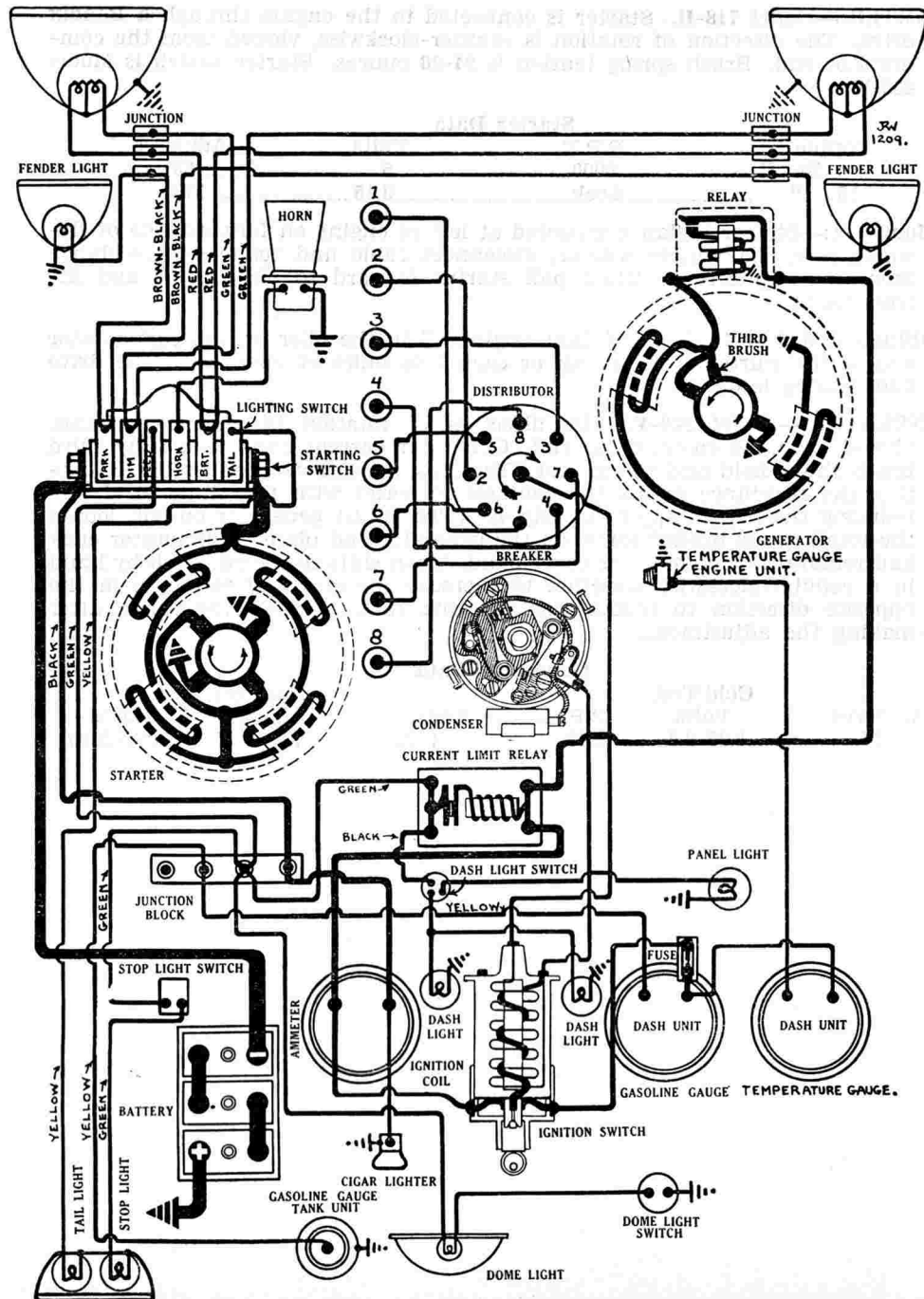
Distributor Model IGH-4011-A. Breaker contacts separate .018-.020 inch. Set contact gap by loosening the two lock screws on the stationary contact mounting plate (first set mounted on breaker plate) and turn eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. The second set (mounted on movable sub-plate) is adjusted by loosening the lock nut on the stationary contact stud and turning up the stud. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine). Maximum automatic advance is 15 degrees (engine) reached at 1450 R.P.M. of engine. The engine is designed to operate with the manual spark control button in the advanced position (pushed all the way inward the dash). Pulling out the button provides an auxiliary retard for hand starting. Breaker has two sets of contacts operating on a four lobe cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on rear of generator at right of engine and is gear driven from the armature shaft. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out mounting screw in advance arm and lift distributor from place.

Oiling:—Put 6 to 8 drops of light engine oil in the oiler on the side of the distributor head every 500 miles of operation. At the same time remove the distributor head and rotor and put 3 or 4 drops of oil in the oiler in the center of the shaft and put one drop of oil on the breaker arm pivot pins. Every 5000 miles put a small bit of grease on the face of the breaker cam.

Timing:—**Synchronization of Contacts.** Synchronize contacts on a rotary spark gap or use special Auto-Lite tool and follow complete directions given in Equipment Section. Contacts can be synchronized after distributor has been timed to the engine by cranking engine over exactly 90 degrees when piston No. 6 will reach firing position ($\frac{5}{8}$ inch on flywheel before top dead center). If the second set of contacts do not open at this point, loosen the two lock screws on the movable sub-plate and shift plate until contacts begin to open. Tighten the lock screws.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position $\frac{5}{8}$ inch (on the flywheel) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). See that spark control button is fully advanced (pushed all the way in toward the dash) and remove inspection hole cover plate (in flywheel case at right of engine). Continue to turn engine over until the ignition mark 'IGN' on the flywheel is directly opposite the indicator in the edge of the inspection hole. Then loosen advance



PEERLESS

STANDARD EIGHT MODEL A (1931)

AUTO-LITE GENERATING, STARTING SYSTEM

AUTO-LITE IGNITION

arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment in the distributor head connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs in order as shown on the diagram.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18MM. Metric. Champion Type 10. Gaps are .027 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1 3/8 inches. Stem diameter, 5/16 inch. Tappet clearance, .006 inch (hot). Inlet valves open 8 degrees after top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 1/4 inches. Stem diameter, 5/16 inch. Valve lift, 5/16 inch. Tappet clearance, .008 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 8 degrees after top dead center.

NOTE:—To set valve timing, crank engine over until piston No. 1 reaches top dead center with the flywheel mark 'DC1&8' directly opposite the indicator in the inspection hole in right side at the top of the flywheel housing. Then turn camshaft until there are exactly 13 links in the timing chain between the small 'o' stamped on the crankshaft sprocket and the camshaft sprocket when the timing chain is assembled. To check setting, first set tappet clearance at .007 inch and turn engine over until exhaust valve in cylinder No. 1 just closes. The flywheel mark 'No.1 EX.CL' should be directly opposite the indicator in the inspection hole. Tappet clearance of intake and exhaust valves should be .007 inch.

STARTER:—Model MAB-4029. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 28-36 ounces. Starter switch is mounted at lower end of steering column.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.	1900		100
3.5 "	1100		200
6.6 "	700		300
10.2 "	410		400
24 "	Lock	4	725

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and remove flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler at each end of the armature every 1000 miles of operation.

GENERATOR:—Model GAL-4134. The direction of rotation is counter-clockwise,

viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The third brush and mounting plate are held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 16-18 amperes (cold) at 8 volts reached at 2025 R.P.M. or 25-30 miles per hour.

Generator Data

Amperes	Volts	R.P.M.
2	6.4	675
6	6.9	835
10	7.3	1025
14	7.65	1275
17.2	8.0	2025
14	7.65	2925

Shunt field current is 4.2 amperes at 6 volts. Brush spring tension is 24-32 ounces. Generator motoring draws 4.7-5.7 amperes at 6 volts.

Mounting:—Generator is flange mounted at right of engine. To remove generator, first disconnect all ignition wiring or remove distributor. Then disconnect generator lead and take out flange mounting screws. Pull generator to rear to disengage coupling and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler at each end of the generator every 500 miles of operation. Every 5000 miles remove the grease cup directly under the bearing retainer on the commutator end of the generator and repack with light grease.

RELAY:—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 10-11 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 1-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contact closed.

LIGHTING:—Pines Lighting Switch Model A-808. Switch is of 'Finger Tip Control' type and incorporates a lighting switch, starting switch and horn button in one unit mounted at the lower end of the steering column and controlled by a button on the steering wheel. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash, dome and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87.

CURRENT LIMIT RELAY:—This device is a vibrating circuit breaker used instead of fuses in the lighting circuit on later cars. It begins to vibrate when the current reaches 25-30 amperes and continues limiting the current to a 15 ampere maximum.

PEERLESS

MASTER EIGHT MODEL B (1931) CUSTOM EIGHT MODEL C (1931) AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—Willard, Type WSB-19, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 145 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 27 hours. Battery is mounted on the left frame member under the floor boards of the front compartment.

IGNITION:—Coil Model CE-4013. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1.5 amperes at 6 volts with engine running and 4.5 amperes at 6 volts with engine stopped.

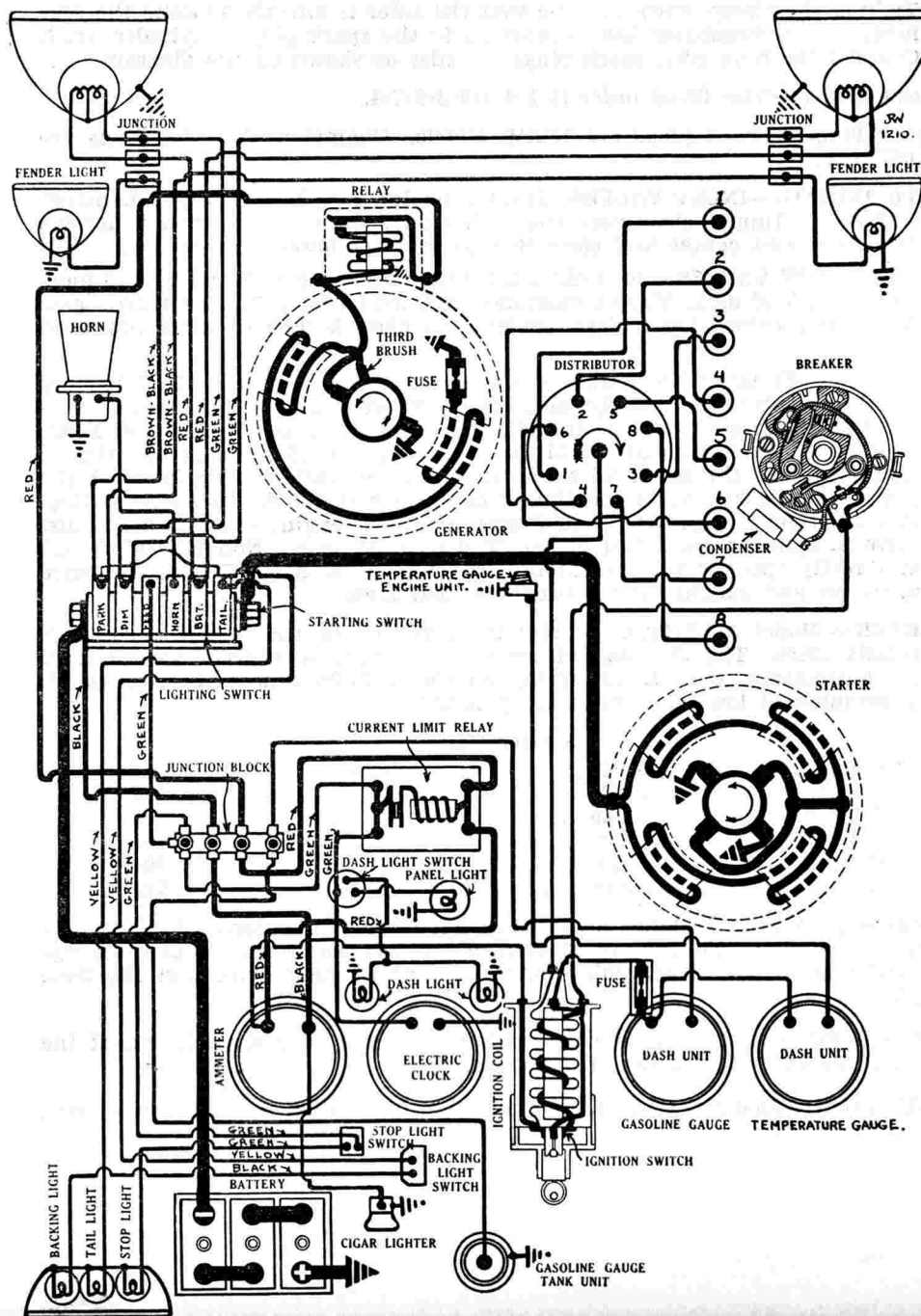
Distributor Model IGH-4010. Breaker contacts separate .018-.020 inch. Set contact gap by loosening two lock screws on stationary contact mounting plate (first set mounted on breaker plate) and turning eccentric adjusting screw until gap is .020 inch with breaker arm on lobe of cam. The second set (mounted on movable sub-plate) is adjusted by loosening the lock nut on the stationary contact mounting stud and turning up the stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine). Maximum automatic advance is 15 degrees (engine) reached at 1450 R.P.M. of engine. The engine is designed to operate with the manual spark fully advanced (with the button pushed all the way in toward the dash). Pulling out the button provides an auxiliary retard. Breaker has two sets of contacts operating on a single four lobe cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head and may be removed from the right side. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take out mounting screw in advance arm and lift distributor from place.

Oiling:—Put 6 or 8 drops of light engine oil in the oiler on the side of the distributor every 500 miles of operation. At the same time remove the distributor head and rotor and put 3 or 4 drops of oil in the oiler in the center of the shaft and put one drop of oil on the breaker arm pivot pins. Every 5000 miles put a small bit of grease on the face of the breaker cam.

Timing:—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Auto-Lite tool and follow complete directions given in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to engine by cranking engine over exactly 90 degrees when piston No. 6 will reach firing position ($\frac{3}{4}$ inch on the flywheel before top dead center with the manual spark control fully advanced). If the second set of contacts (mounted on movable sub-plate) do not open at this point, loosen the two lock screws and turn the eccentric adjusting screw until the contacts begin to open. Tighten the lock screws.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position $\frac{3}{4}$ inch (on the flywheel) before top dead center with the spark control button fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). See that spark control button is pushed all the way in toward the dash and remove inspection hole cover in left front of flywheel housing. Turn engine over until the ignition mark



PEERLESS

MASTER EIGHT MODEL B (1931) CUSTOM EIGHT MODEL C (1931) AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

'IGN' on the flywheel is directly opposite the indicator on the edge of the inspection hole. Then loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment in the distributor head connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs as shown on the diagram.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18MM. Metric. Champion Type 9-S. Gaps are .027 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1 $\frac{5}{8}$ inches. Stem diameter, .3710-.3715 inch. Stem length, 4 $\frac{13}{16}$ inches. Valve lift, $\frac{5}{16}$ inch. Spring pressure, 105 pounds. Tappet clearance, .007 inch. Inlet valves open 2 degrees after top dead center and close 47 degrees after lower dead center.

EXHAUST VALVES:—Head diameter, 1 $\frac{9}{16}$ inches. Stem diameter, .3710-.3715 inch. Stem length, 4 $\frac{13}{16}$ inches. Valve lift, $\frac{5}{16}$ inch. Spring pressure, 105 pounds. Tappet clearance, .007 inch. Exhaust valves open 43 degrees before lower dead center and close 2 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are made for replacement.

To Set Valve Timing:—Crank engine over until piston No. 1 reaches top dead center when the flywheel mark 'DC 1&8' will be directly opposite the indicator in the inspection hole in the left front of the flywheel housing. Then turn camshaft so that there will be 10 links between the small 'o' stamped on the crankshaft sprocket and the camshaft sprocket when the chain is installed. To check timing, set No. 1 exhaust tappet clearance at .007 inch and crank engine over until No. 1 exhaust valve has just closed. The flywheel mark 'No.1 EX.CL.' should be directly opposite the indicator.

STARTER:—Model ML-4146. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter brush tension is 20-24 ounces. The starting switch is mounted at the lower end of the steering column.

Starter Data

Torque	R.P.M.	Volts	Amperes
0 lb. ft.	Free	5.5	50
1.1 "	1940	5.5	100
4.3 "	1050	5.0	200
7.8 "	650	4.5	300
11.4 "	350	3.5	400
16 "	Lock	3.0	560

Mounting:—Starter is flange mounted at right of engine on forward side of flywheel housing. To remove starter, disconnect cable and take out flange mounting screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler at each end of the armature every 1000 miles of operation.

GENERATOR:—Model GAR-4111. The direction of rotation is counter-clockwise,

viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush and mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 16-18 amperes (cold) at 8 volts reached at 2075 R.P.M. or 25-30 miles per hour.

Generator Data

Amperes	Volts	R.P.M.
2	6.4	675
6	6.9	835
10	7.3	1025
14	7.65	1275
17.2	8.0	2075
14	7.65	2925

Shunt field current is 4.2 amperes at 6 volts. Brush spring tension is 24-32 ounces. Generator motoring draws 4.7-5.7 amperes at 6 volts. A 7.5 ampere field fuse is mounted on the end plate.

Mounting:—Generator is mounted by special flange mounting at left of engine and is driven by the fan belt. To remove generator, disconnect lead and take out bolts in mounting flange under generator field frame. Then slip off drive belt and lift generator from place.

Oiling:—Put 5 or 6 drops of light engine oil in the oiler at each end of the generator every 500 miles of operation. Every 5000 miles remove the grease cup under the bearing retainer on the commutator end of the generator and fill with light grease.

RELAY:—Model CB-4014. Relay is mounted on the generator. Relay contacts close at 675 R.P.M. or 10-11 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 1-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Pines Lighting Switch Model A-808. The switch is of the 'Finger Tip Control' type and incorporates the lighting switch, starting switch and horn button in a single unit mounted at the lower end of the steering column and controlled by a button on the steering wheel. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash, dome and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing lights are each 6-8 volt, 15 cp. S.C. Mazda 87.

FUSES:—Generator field fuse is 7.5 ampere capacity.

CURRENT LIMIT RELAY:—This device is a vibrating circuit breaker installed in later cars instead of the lighting fuses. It begins to vibrate when the current in the lighting circuits reaches 25-30 amperes and continues limiting the current to 15 amperes maximum.

PIERCE ARROW

MODEL 41 (1931) SERIAL NUMBERS 3,050,001 UP

MODEL 42 (1931) SERIAL NUMBERS 2,525,001 UP (134" WB) 1,025,001 UP

PRODUCTION STARTED JANUARY 3, 1931

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

BATTERY:—Willard, Type WJ-4-15. 6 volt, 132 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 145 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 26 hours. Battery is mounted on the right frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 528-E (2 used). Coils are mounted on the dash. Ignition current is 3.6 amperes at 6 volts with engine running and 8 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' type co-incidental steering post and ignition switch lock.

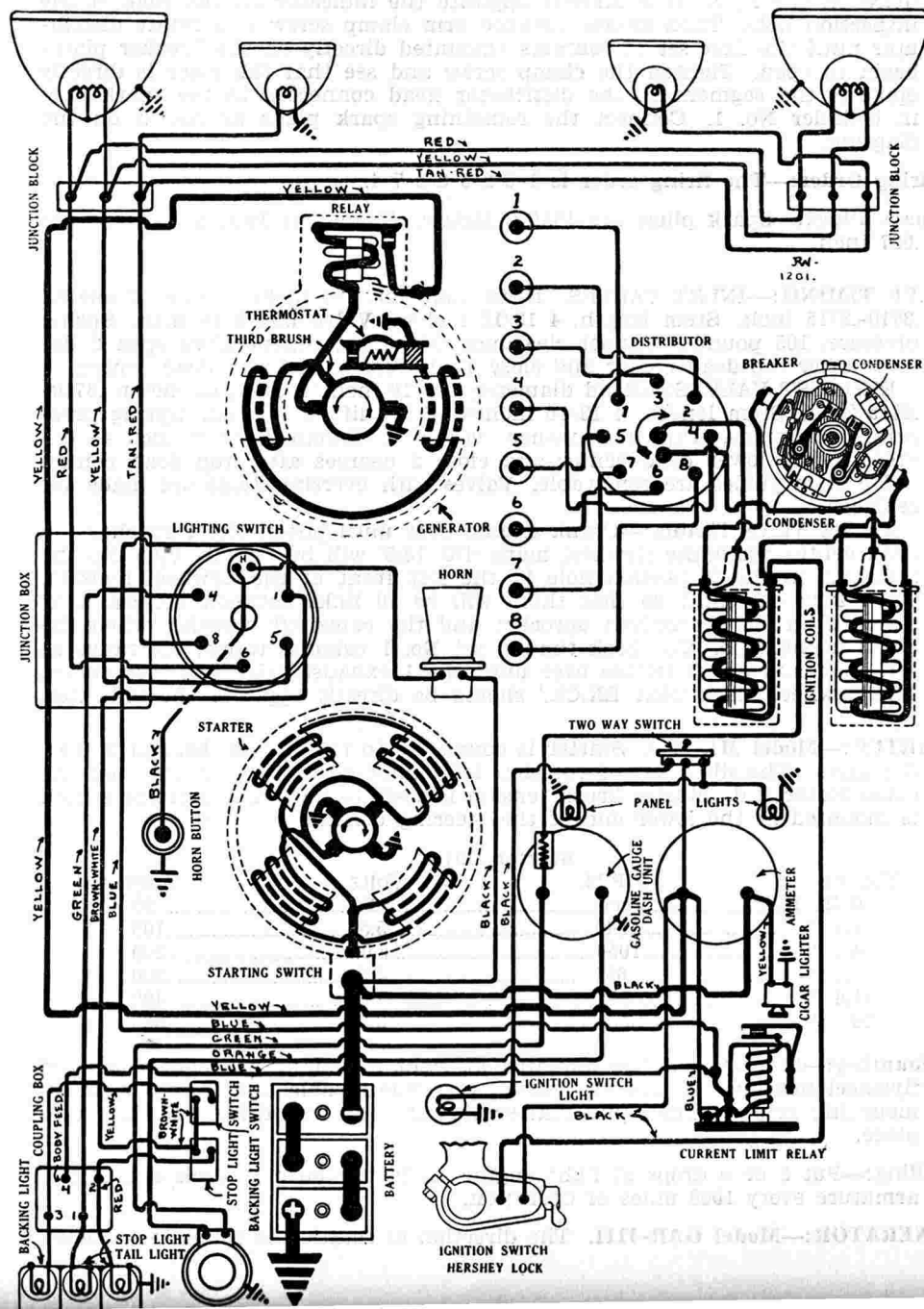
Distributor Model 668-E. Breaker contacts separate .018 inch. Set contact gap by loosening lock screw on stationary contact mounting plate directly behind contacts and turning up eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 35 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 18 degrees reached at 3300 R.P.M. Breaker has two sets of contacts operating on a four sided cam. Each set of contacts controls one coil and fires the spark plugs in four cylinders. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized for satisfactory ignition performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head and can be removed from the right side. To remove distributor, disconnect primary leads and spark control and remove distributor head with cables intact. Then take off three nuts on base of mounting studs and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft and turn down two full turns every 2500 miles. At the same time remove the distributor head and rotor and put 8 or 10 drops of light engine oil in the wick oiler in the center of the shaft and put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Contacts must be synchronized so that the set mounted on the movable sub-plate open exactly 45 degrees after the first set, which is mounted directly on the breaker plate. To synchronize contacts use special Delco-Remy tool, Part No. 1835009, and follow complete directions in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to engine by cranking engine over exactly 270 degrees from firing position of piston No. 1 when piston No. 5 will reach firing position (8° 26' before top dead center with flywheel mark 'IGN/5-4' at the indicator). If the second set of contacts do not open at this point, loosen the two lock screws on the mounting sub-base and turn the eccentric adjusting screw until they begin to open. Tighten the lock screws and check the contact gap with the breaker arm on the lobe of the cam. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches a position 8/ 26' on the flywheel before top dead center with the manual spark control in the fully advanced position (vertical). To set timing, crank engine over until No. 1 piston enters compression stroke (the up stroke with both valves closed). Fully advance spark control and take off cover plate in flywheel inspection



PIERCE ARROW

MODEL 41 (1931) SERIAL NUMBERS 3,050,001 UP
MODEL 42 (1931) SERIAL NUMBERS 2,525,001 UP (134" WB) 1,025,001 UP
PRODUCTION STARTED JANUARY 3, 1931
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

opening. Then crank engine over until the ignition mark 'IGN/1-8' on the flywheel is directly opposite the indicator on the housing. Loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted directly on the base plate) begin to open. Tight the clamp screw and see that the rotor is directly opposite the segment in the distributor head connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs as shown on the diagram.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 7/8-18 S.A.E. standard. Champion No. C-4. Gaps are .025-.030 inch.

VALVE TIMING:—INLET VALVES Head diameter, 1 21/32 inches. Stem diameter, .3725 inch. Valve lift, .359 inch. Spring pressure, 50-55 pounds. Tappet clearance, .004 inch (hot). Inlet valves open 5 degrees after top dead center and close 45 degrees after lower dead center. The flywheel is marked "IN.OP/1-8" and "IN.OP/5-4" at points 5 degrees before the top dead center position for pistons Nos. 1 and 5.

EXHAUST VALVES. Head diameter, 1 9/16 inches. Stem diameter, .3715 inch. Valve lift, .359 inch. Spring pressure, 50-55 pounds. Tappet clearance, .006 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 12 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model 728-C. Starter is connected to the engine through a manual pinion shift interconnected with the starting switch. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Starter brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
1 "	1500	5.5	100
4.8 "	725	5.4	200
9.3 "	425	4.5	300
15.8 "	250	4.1	400
20 "	20	3.6	500
28 "	Lock	3.0	600

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and remove three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in each of the starter bearing oilers every 2500 miles. Once each year remove the grease plug in the reduction gear case and repack gears with medium grease.

GENERATOR:—Model 927-F. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third

brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the outside of the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting, the maximum charging rate is 22 amperes at 8.5 volts reached at 1600 R.P.M. of generator of 26 M.P.H.

Generator Data					
Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
20-22	8.5	1600	12-14	7.75	1800

Shunt field current is 5 amperes at 6 volts. Brush spring tension is 14-18 ounces. Generator motoring draws 5.5 amperes at 6 volts.

Mounting:—Generator is flange mounted at the left front of the engine and is driven by the fan belt. To remove generator, disconnect lead and take off drive belt. Then remove flange mounting screws and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in each of the generator bearing oilers every 2500 miles.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay contacts close at approximately 7 miles per hour when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contacts separate .015-.025 inch. Air gap is .014 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 486-D. Lighting switch is mounted at the lower end of the steering column. Headlight equipment includes headlights mounted on the fenders and auxiliary lights mounted on brackets, or bracket headlights with auxiliary lights on the fenders. In either installation the headlights are fitted with double filament bulbs using the second 32 cp. filament instead of dimmers. Headlights are 6-8 volt, 32-32 cp. D.C. Mazda 1000. Auxiliary lights are 6-8 volt, 6 cp. S.C. Mazda 81. Dash lights are 6-8 volt, 3 cp. S.C. Mazda 63. Tail light is 6-8 volt, 6 cp. S.C. Mazda 81. Stop and backing lights are each 6-8 volt, 21 cp. S.C. Mazda 1129. Dome light is 6-8 volt, 15 cp. Mazda 87. Corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

CURRENT LIMIT RELAY:—Model 410-E. This device is a vibrating circuit breaker mounted on the dash and connected in the lighting circuits. It begins to vibrate when the current reaches 30-35 amperes and continues to operate limiting the current to 5-18 amperes. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed. Plunger spring tension is 5 ounces minimum.

PIERCE ARROW

MODEL 43 (1931) SERIAL NUMBERS 1,500,001 UP
PRODUCTION STARTED JANUARY 3, 1931
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

BATTERY:—Willard, Type WJ-4-15... 6 volt, 132 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 145 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 26 hours. Battery is mounted on the left frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 528-E. Coil is mounted on the dash. Ignition current is 1.8 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' type co-incidental steering post and ignition switch lock.

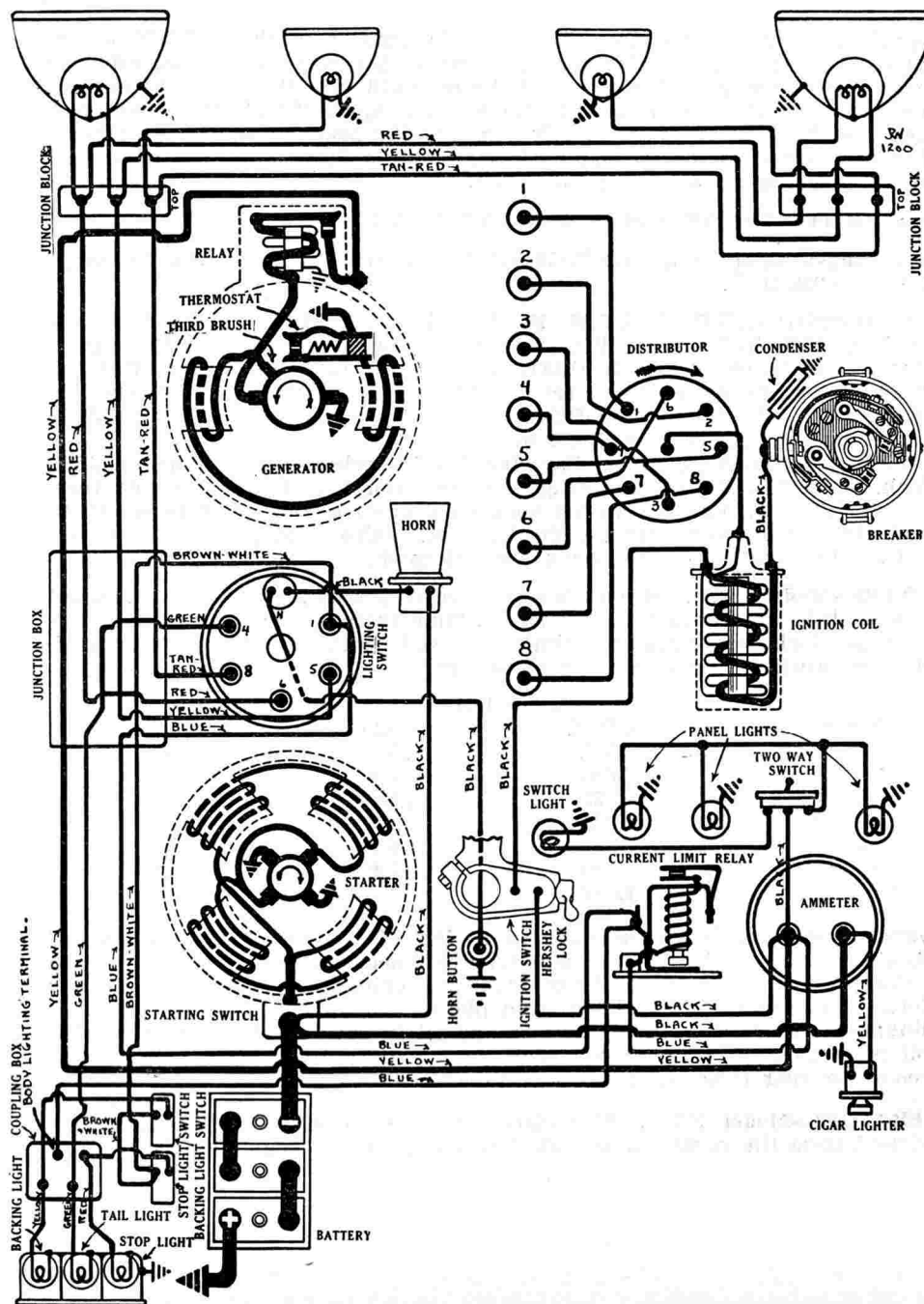
Distributor Model 660-P. Breaker contacts separate .018 inch. Set contact gap by loosening lock screw on stationary contact mounting plate directly behind contacts and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 35 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 16 degrees reached at 2600 R.P.M. of engine. Distributor has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized for correct ignition performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect primary lead and manual advance rod and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the shaft with medium cup grease and turn down two full turns every 2500 miles. At the same time remove the distributor head and rotor and put 8 or 10 drops of light engine oil in the oiler in the center of the shaft and put a small bit of vaseline on the face of the breaker cam.

Timing:—**Synchronization of Contacts.** The contacts must be synchronized so that the set mounted on the movable sub-base open exactly 45 degrees after the set mounted directly on the breaker plate for satisfactory engine performance. To synchronize contacts, use special Delco-Remy tool, Part No. 1838182, and follow complete directions given in Equipment Section. The contacts may be synchronized without special equipment after the distributor has been timed to the engine by cranking the engine over exactly 270 degrees from the firing position of piston No. 1 when piston No. 5 will reach firing position. (8° 26' before top dead center with flywheel mark 'IGN/5-4' opposite the indicator.) If the second set of contacts are not opening at this point, loosen the two lock screws on the movable sub-base and turn the eccentric adjusting screw until the contact points begin to open. Tighten the lock screws and check the contact gap with the breaker arm on the lobe of the cam. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to separate when the piston entering power stroke reaches a position 8° 26' on the flywheel before top dead center with the manual spark control in the fully advanced position (vertical). To set timing, crank engine over until No. 1 piston enters compression stroke (the up stroke with both valves closed). Fully advance spark control and take off cover plate in flywheel inspection opening. Then crank engine over until the ignition mark 'IGN/1-8'



PIERCE ARROW

MODEL 43 (1931) SERIAL NUMBERS 1,500,001 UP
PRODUCTION STARTED JANUARY 3, 1931
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

on the flywheel is directly opposite the indicator on the housing. Loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted directly on the base plate) begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment in the distributor head connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs as shown on the diagram.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Standard. Champion No. C-4. Gaps are .025-.030 inch.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1 $\frac{21}{32}$ inches. Stem diameter, .3725 inch. Valve lift, .359 inch. Spring pressure, 50-55 pounds. Tappet clearance, .004 inch (hot). Inlet valves open 5 degrees after top dead center and close 45 degrees after lower dead center. The flywheel is marked 'IN.OP./1-8' and 'IN.OP./5-4' at points 5 degrees before the top dead center positions for pistons Nos. 1 and 5.

EXHAUST VALVES:—Head diameter, 1 $\frac{9}{16}$ inches. Stem diameter, .3715 inch. Valve lift, .359 inch. Spring pressure, 50-55 pounds. Tappet clearance, .006 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 12 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model 728-C. Starter is connected to the engine through a manual shift interconnected with the starting switch. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Starter brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
1 "	1500	5.5	100
4.8 "	725	5.4	200
9.3 "	425	4.5	300
15.8 "	250	4.1	400
20 "	200	3.6	500
28 "	Lock	3.0	600

Mounting:—Starter is flange mounted at left engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and return spring. Then remove three flange mounting cap screws. Pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in each of the starter bearing oilers every 2500 miles. Once each year remove the grease plug in the reduction gear case and repack gears with medium grease.

GENERATOR:—Model 927-L. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by

third brush shunt field and thermostat. Thermostat contacts open at 165° F. cutting the resistance connected across the thermostat contacts in series with the field and reduce the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed lock screw on the outside of the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting, the maximum charging rate is 22 amperes at 8.5 volts reached at 1600 R.P.M. or 26 M.P.H.

Generator Data					
Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
20-22	8.5	1600	12-14	7.75	1800

Shunt field current is 5 amperes at 6 volts. Brush spring tension is 14-18 ounces. Generator motoring draws 5.5 amperes at 6 volts.

Mounting:—Generator is flange mounted at the left front of the engine and is driven by the fan belt. To remove generator, disconnect lead and take off drive belt. Then remove flange mounting screws and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 2500 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay closes at 7 miles per hour when the voltage of the generator reaches 7-7.5 volts and opens with a discharge current of 0-2.5 amperes. Relay contacts separate .015-.025 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 486-D. Lighting switch is mounted at the lower end of the steering column. Headlight equipment includes headlights mounted on fenders with auxiliary lights mounted on brackets, or bracket headlights with auxiliary lights mounted on the fenders. In each installation the headlights are fitted with double filament bulbs using a second 32 cp. filament instead of dimmers. Headlights are 6-8 volt, 32-32 cp. D.C. Mazda 1000. Auxiliary headlights are 6-8 volt, 6 cp. S.C. Mazda 81. Dash lights are 6-8 volt, 2 cp. S.C. Mazda 63. Tail light is 6-8 volt, 6 cp. S.C. Mazda 81. Stop and backing lights are each 6-8 volt, 21 cp. S.C. Mazda 1129. Dome light is 6-8 volt, 15 cp. S.C. Mazda 87. Corner lights are 6-8 volt, 3 cp. S.C. Mazda 63.

CURRENT LIMIT RELAY:—Model 410-E. This device is a vibrating circuit breaker mounted on the dash and connected in the lighting circuits. It begins to operate when the current reaches 25-30 amperes and continues to vibrate limiting the current to 5-18 amperes. Circuit breakers contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed. Plunger spring tension is 5 ounces minimum.

PLYMOUTH

MODEL 30-U (1930-31)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WS-1-13, 6 volt, 80 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 16.8 hours. Battery is mounted under the front floor boards on the left frame member.

IGNITION:—Coil Model 526-M. The ignition switch is built in the base of the coil. Ignition coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

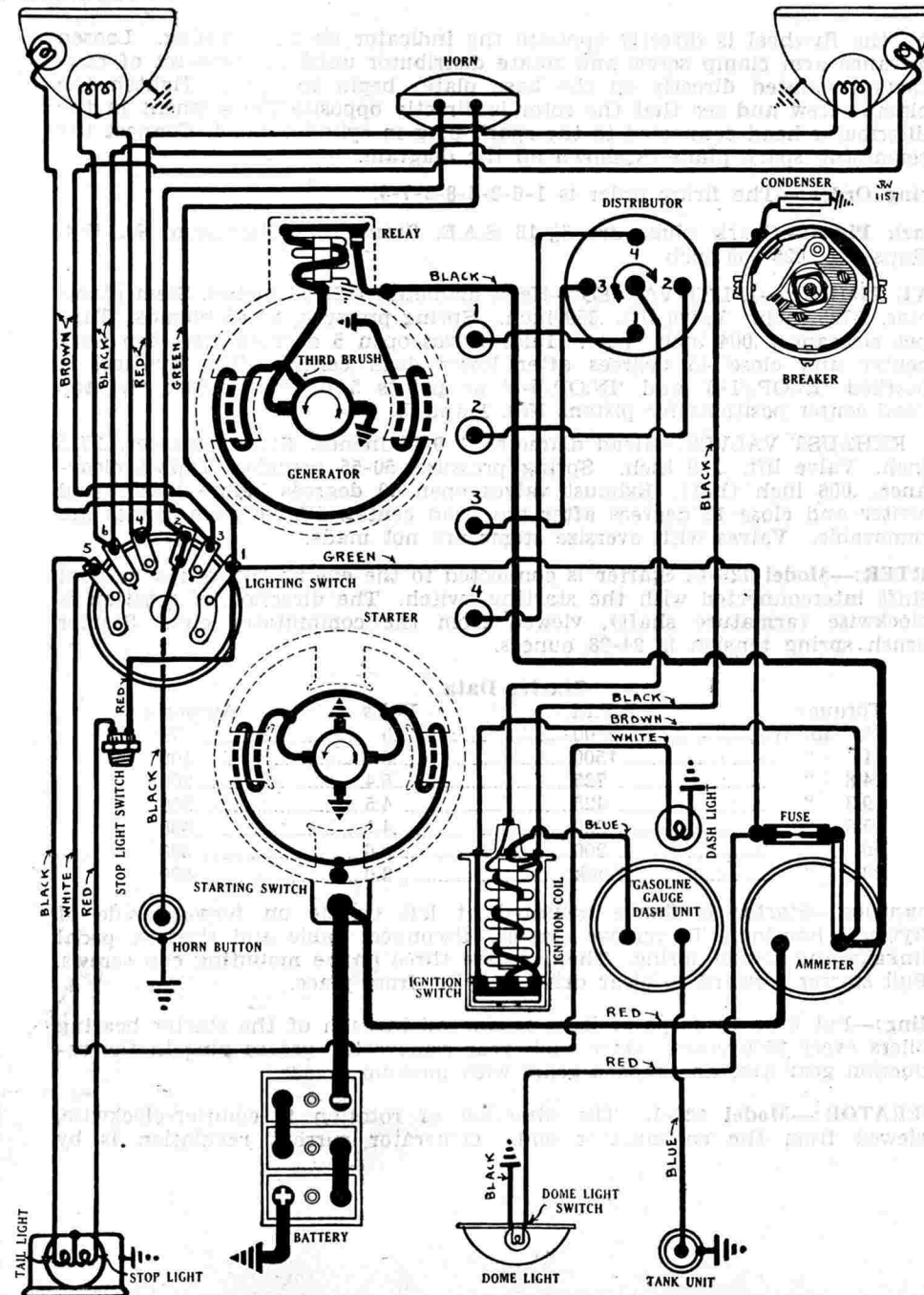
Distributor Model 629-A. rBeaker contacts separate .020 inch. Set contact gap by loosening lock screw on crescent shaped stationary contact mounting plate and turning eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 22 degrees (engine). Automatic advance begins at 800 R.P.M. of the engine. Maximum automatic advance is 18 degrees reached at 2400 R.P.M. of the engine.

Mounting:—Distributor is mounted at the front of the engine and is driven by spiral gears from the forward end of the camshaft. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor housing and turn down two turns every month or each 1000 miles. Keep the oiler on the distributor drive gear compartment filled with light engine oil. Every 2000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position .050 inch (actual piston travel) before top dead center with the manual spark control in the fully advanced position. To set timing, remove spark plug in cylinder No. 1 and screw the special micrometer timing gauge in place in the opening. Fully advance the manual spark control. Connect a six volt test lamp in series with the primary circuit by connecting one test lamp lead to the primary terminal on the distributor and the other lead to the relay terminal on the generator. If the battery is out of the car, connect this lead to one terminal of a six volt battery and ground the other battery terminal to the car frame. The lamp will remain lighted while the contacts are closed and will go out as the contacts open. Turn the engine over until piston No. 1 reaches top dead center and set micrometer gauge at zero. Then turn engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed) and stop when the gauge indicates .050 inch before top dead center. Loosen advance arm clamp screw and rotate distributor until the lamp goes out, indicating that the contacts are beginning to open. Tighten the clamp screw and see that the rotor is directly opposite No. 1 segment in the distributor head (see diagram). To check the ignition setting, crank the engine over several times and then stop with piston No. 1 on compression stroke at the exact instant the lamp goes out. If the gauge reading is between .055-.045 inch before top dead center the timing is satisfactory.

NOTE:—The new type timing gauge has a visible spark gap built in the gauge. If this indicator is used one terminal lead on the gauge should be clipped to the high tension lead from the coil at the distributor and the



PLYMOUTH

MODEL 30-U (1930-31)

DELCO-REMY GENERATING STARTING SYSTEM DELCO-REMY IGNITION

other gauge terminal lead should be grounded to the engine. Turn on ignition and proceed with timing. No test lamp need be used.

Firing Order:—The firing order is 1-3-4-2.

Spark Plugs:—Spark plugs are 18 MM. Metric. Gaps are .020-.025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1 27/32 inches. Stem diameter, 11/32 inch. Stem length, 5 1/16 inches. Valve lift, .3125 inch. Spring pressure, 38-43 pounds (valve closed), 54-59 pounds (valve open). Tappet clearance, .005 inch (hot). Inlet valves open at top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 19/32 inches. Stem diameter, 11/32 inch. Stem length, 5 1/16 inches. Valve lift, .3125 inch. Spring pressure, 38-43 pounds (valve closed), 54-59 pounds (valve open). Tappet clearance, .007 inch (hot). Exhaust valves open 48 degrees before lower dead center and close 2 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model 714-Q. Starter is connected to the engine through a mechanical pinion shift interconnected with the starting switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5	65
12 "	Lock	3.63	475

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out two flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles of operation. The drive end bearing is oilless.

GENERATOR:—Model 943-R. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and loosen the small round headed lock screw on the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging

rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 16 amperes (cold) reached at 2100 R.P.M.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
0	6.4	760	0	6.4	850
6	7.0	1000	6	7.0	1200
10	7.4	1200	10	7.4	1600
16	8.0	2100	12.5	7.7	2300
12	7.7	3200	10	7.5	3200

Shunt field current is 4-5.9 amperes at 6 volts. Generator, motoring, draws 3 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is mounted on special hinge bracket at left of engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward the engine and slip off the drive belt. Then remove the two bolts forming the bracket hinge and lift generator from place.

Belt Adjustment. The fan belt tension is adjusted by loosening the adjustment clamp bolt and the hinge bolts and then swinging the generator away from the engine until the correct belt tension is secured. Tighten the clamp bolt and bracket bolts after making the adjustment. The belt tension should be just sufficient to drive the generator and fan without slipping.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 1000 miles of operation.

RELAY:—Model 265-G. Relay is mounted on the generator. Relay closes at 750 R.P.M. when the generator voltage reaches 6.4-7 volts and opens with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—Clum Switch Model 9150. Lighting switch is mounted at lower end of steering column and is controlled by a lever on the steering wheel. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights (in headlights) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light is 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail light is 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament. Dome light is 6-8 volt, 15 cp. S.C. Mazda 87.

FUSES:—Lighting fuse mounted on the back of the ammeter is 20 ampere capacity.

PONTIAC

MODEL 401 (1931) SERIAL NUMBERS 649,001 UP
PRODUCTION STARTED NOVEMBER 5, 1930
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

BATTERY:—Various batteries are used. They are 6 volt, 86 ampere hour. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 17 hours. Battery is mounted on the left frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 526-R. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 2 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped.

Distributor Model 639-U. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on crescent shaped stationary contact mounting plate and turning eccentric adjusting screw until breaker gap is .022 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is of the full automatic type. Automatic advance begins at 500 R.P.M. of engine. Maximum automatic advance is 22 degrees reached at 2600 R.P.M. of the engine.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect primary lead and remove distributor head with cables intact. Then take out the lock nut and mounting screw on the side of the engine block between cylinders Nos. 3 and 4 and remove and hold-down screw in the advance arm. Then lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor with No. 3 soft cup grease and turn down one full turn every two weeks or each 500 miles of operation. Every 1000 miles remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil and put one drop of oil on the breaker arm pivot pin. Put a small bit of vaseline on the face of the breaker cam.

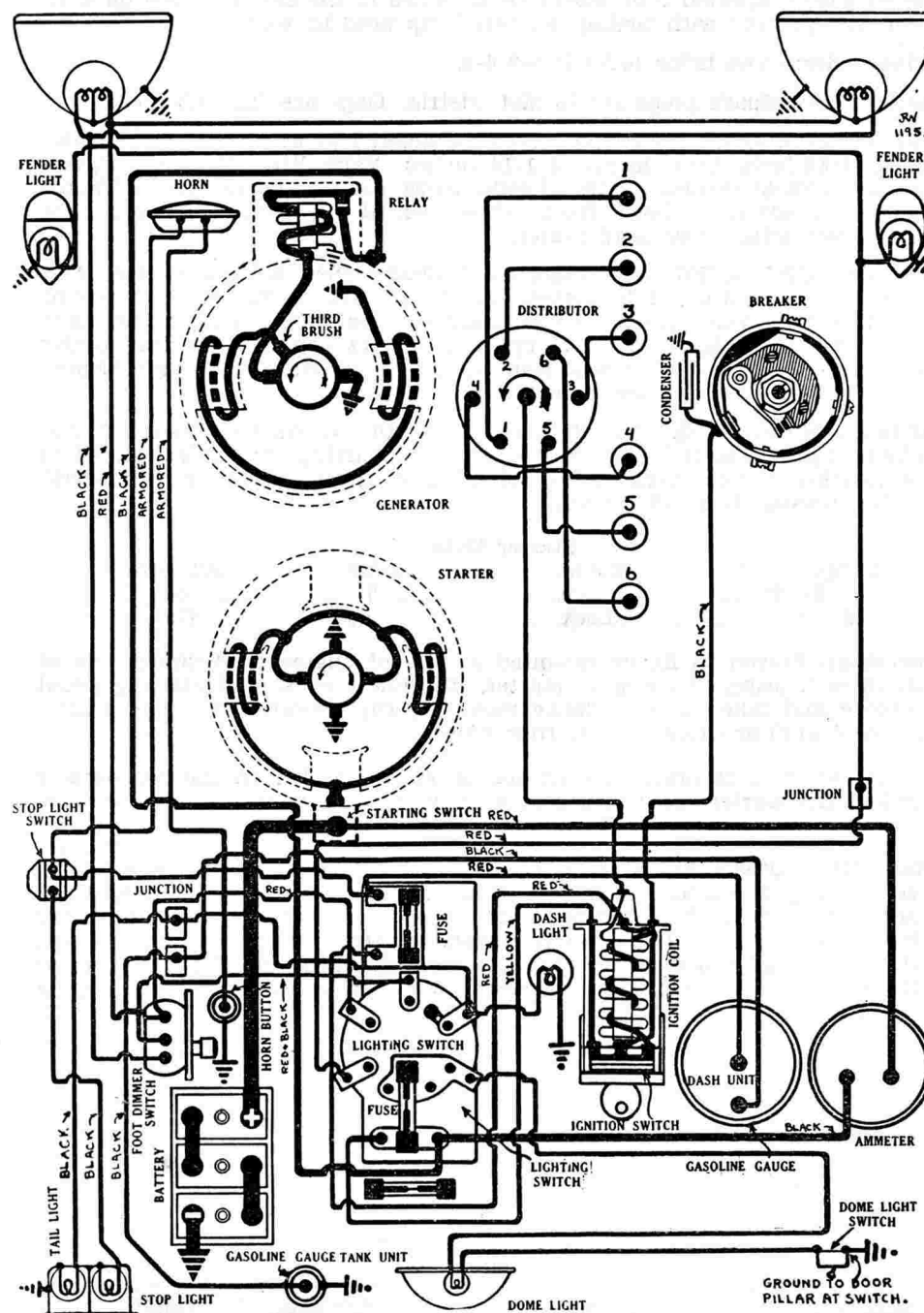
Timing:—Breaker contacts begin to separate when piston entering power stroke reaches a position 4 degrees (on the flywheel) before top dead center. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Turn engine over until piston reaches firing position when the ignition mark '1&6/IGN' on the flywheel is directly opposite the indicator on the flywheel case. This mark is 4 degrees before the top dead center mark '1&6/UDC'. Then loosen the advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment connected to the spark plug in cylinder No. 1.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18MM. Metric. A.C. Type G-14. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES:**—Head diameter, 1 13/32 inches. Stem diameter, 5/16 inch. Stem length, 3 7/8 inches. Valve lift, 5/16 inch. Spring pressure, 32-37 pounds (spring length, 1 3/4 inches). Tappet clearance, .007-.009 inch (hot). Inlet valves open 7 degrees past top dead center and close 39 degrees past lower dead center. The flywheel is marked 'IN.OP./1&6' at the point of inlet opening of cylinder No. 1.

EXHAUST VALVES:—Head diameter, 1 11/32 inches. Stem diameter, 5/16 inch. Stem length, 3 7/8 inches. Valve lift, 5/16 inch. Spring pressure, 32-



PONTIAC

MODEL 401 (1931) SERIAL NUMBERS 649,001 UP
PRODUCTION STARTED NOVEMBER 5, 1930
DELCO-REMY GENERATING, STARTING SYSTEM
DELCO-REMY IGNITION

37 pounds (spring length, $1\frac{3}{4}$ inches). Tappet clearance, .007-.009 inch (hot). Exhaust valves open 42 degrees before lower dead center and close at top dead center. Valve stem guides are removable. Valves with over-size stems are not made.

STARTER:—Model 714-R. Starter is connected to the engine through a Dyer manual pinion shift. The first movement of the starting pedal compresses two springs within a sleeve mounted on the starter shaft. These springs force the starter drive pinion in mesh with the flywheel gear. The further movement of the pedal closes the starting switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	5000	5	65
12 "	Lock	3.63	475

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting pedal linkage and remove flange mounting cap screws. Then pull starter forward and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every month or each 1000 miles. The drive end bearing is oilless.

GENERATOR:—Model 943-J. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 17 amperes (cold) reached at 1700 R.P.M. or 25 M.P.H.

Generator Data

Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
16-18	8.2	1700	11-13	7.55-7.85	1750-1850

Motoring, generator draws 5.5 amperes at 6 volts. Shunt field current is 3.5-4.5 amperes at 6 volts. Brushes pring tension is 14-18 ounces.

Mounting:—Generator is mounted at left of engine by special swinging bracket. To remove generator, disconnect lead and loosen adjustment clamp arm bolt. Swing generator toward engine and slip off drive belt. Then take pivot bolt holding generator on bracket and lift from place.

Belt Adjustment. To tighten fan belt, loosen adjustment clamp arm bolt and swing generator out from engine until proper belt tension is secured. Then tighten bolt. Be careful not to get the belt too tight or it will cause excessive wear of generator bearings.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every month or each 1000 miles.

RELAY:—Model 265-H. Relay is mounted on the generator. Relay contacts close at 575 R.P.M. or 7-10 M.P.H. when the generator voltage reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Contacts separate .015-.025 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—Clum Switch Model 9191. Lighting switch is mounted on the instrument panel. Double filament headlights are used. They are controlled by the dimmer switch mounted on the toeboard. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Side, dash, tail and dome lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

Dimmer switch is Delco-Remy Model 465-J.

FUSES:—Lighting fuse mounted on the back of the switch is 20 ampere capacity. A spare fuse is also mounted on the switch. The small fuse at the top of the switch (in the gasoline gauge line) is 3 ampere capacity.

REO

MODEL 25—FLYING CLOUD SIX (1931) SERIAL NUMBERS 25N-1 UP DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type SJRR-4. 6 volt, 111 ampere hour. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 125 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 22 hours. Battery is mounted on the right frame member.

IGNITION:—Coil Model 528-E. Coil is mounted on the dash. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped. The ignition switch is a Delco-Remy Dual-lock Model 425-R.

Distributor Model 640-S. Breaker contacts separate .018-.024 inch. Set the contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw until gap is .020 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine). Automatic advance begins at 900 R.P.M. of the engine. Maximum automatic advance is 19 degrees reached at 2400 R.P.M.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect primary lead and manual advance rod and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down two turns every month or each 1000 miles of operation. Remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil. Put one drop of oil on the breaker arm pivot pin and place a small bit of vaseline on the face of the breaker cam.

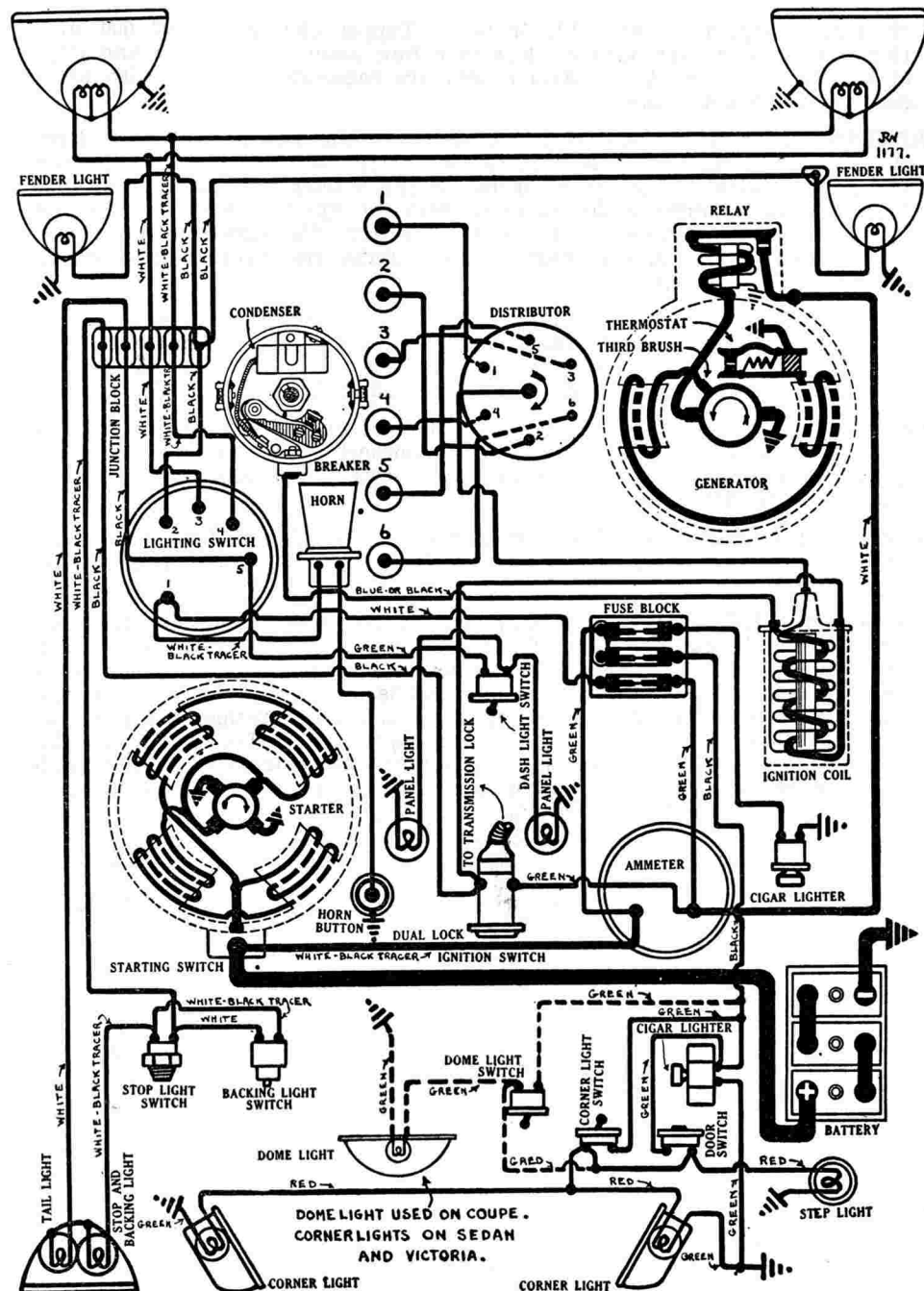
Timing:—Breaker contacts begin to open when the piston entering the power stroke reaches a position $1\frac{1}{4}$ inches (measured on the flywheel) before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control (push the button in toward the dash) and remove the timing inspection cover over the inspection hole in the flywheel case. Then turn engine over until a point on the flywheel $1\frac{1}{4}$ inches before the top dead center mark 'UDC#1' is opposite the indicator on the housing. Loosen the advance arm clamp screw and rotate the distributor until the contacts begin to open. Tighten the clamp screw and see that the segment in the distributor head opposite the rotor is connected to the spark plug in cylinder No. 1.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. Champion No. 11. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, $1\frac{13}{16}$ inches. Stem diameter, .3437 inch. Stem length, $5\frac{3}{4}$ inches. Valve lift, $\frac{5}{16}$ inch. Spring pressure, 58-60 pounds (spring length, $2\frac{3}{8}$ inches), 90 pounds (spring length, $2\frac{1}{16}$ inches). Tappet clearance, .007 inch. Inlet valves open at top dead center and close 50 degrees after lower dead center. The flywheel is marked 'UDC#1' at inlet opening point for cylinder No. 1.

EXHAUST VALVES. Head diameter, $1\frac{13}{16}$ inches. Stem diameter, .3437 inch. Stem length, $5\frac{3}{4}$ inches. Valve lift, $\frac{5}{16}$ inches. Spring pres-



REO

MODEL 25—FLYING CLOUD SIX (1931) SERIAL NUMBERS 25N-1 UP DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

sure, 58-60 pounds (spring length, $2\frac{3}{8}$ inches), 90 pounds (spring length, 2 $\frac{1}{16}$ inches. Tappet clearance, .007 inch. Exhaust valves open 48 degrees before lower dead center and close 2 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model 728-M. Starter is connected to the engine through a set of reduction gears and overrunning clutch by means of a mechanical pinion shift interconnected with the starting switch. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Starter cranks the engine at 150 R.P.M. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3	600

Mounting:—Starter is flange mounted at left of engine on the forward face of the flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out three flange mounting capscrews. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in each of the starter oilers every month or each 1000 miles of operation. Every six months or each 5000 miles remove the grease plug in the reduction gear case and repack gears with graphite grease.

GENERATOR:—Model 955-G. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round lock screw on the outside of the end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 18-19 amperes reached at 1450 R.P.M. or 25-26 M.P.H.

Generator Data

Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8.5	1450	9-12	7.5	2000

Generator, motoring, draws 5 amperes at 6 volts. Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is flange mounted at right of engine on the rear face of the timing chain case. To remove generator, disconnect lead and take out flange mounting cap screws. Then slide generator to the rear to disengage drive coupling and lift from place. Generator is driven through a slotted tongue coupling by the accessory sprocket which is mounted independently in the chain case. The timing chain tension is adjusted by shifting the generator. To take up timing chain, loosen the three mounting screws and shift the generator away from the engine. Tighten the mounting screws and operate the engine. If the chain hums, the adjustment is too tight and the generator must be backed off slightly. With proper adjustment the chain should run noiselessly. Do not operate the engine unless the generator mounting screws are tight.

Oiling:—Put 8 or 10 drops of light engine oil in each of the generator bearing oilers every month or each 1000 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator field frame. Relay contacts close at 575 R.P.M. when the generator voltage reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap should be .014-.020 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 482-F. Lighting switch is mounted at the base of the steering column and is controlled by a lever on the steering wheel. Double filament headlight bulbs are used. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights (on fenders) are 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing lights are each 6-8 volt, 15 cp. S.C. Mazda 87. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome light is 6-8 volt, 3 cp. D.C. Mazda 64.

FUSES:—Lighting fuses mounted on the dash fuse block are 20 ampere capacity.

REO

MODEL N-30 FLYING CLOUD EIGHT (1931) SERIAL NUMBERS 30N-1 UP MODEL N-35 ROYALE EIGHT (1931) SERIAL NUMBERS 35N-1 UP DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type RJ-4-15. 6 volt, 128 ampere hour. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 145 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 25.6 hours. Battery is mounted on the left frame member.

IGNITION:—Coil Model 528-E. Coil is mounted on the dash. Ignition current is 2.5 amperes at 6 volts with engine running and 4.5-5 amperes at 6 volts with engine stopped. The ignition switch is a Delco-Remy Dual-lock, Model 425-R or 425-T (four speed transmission).

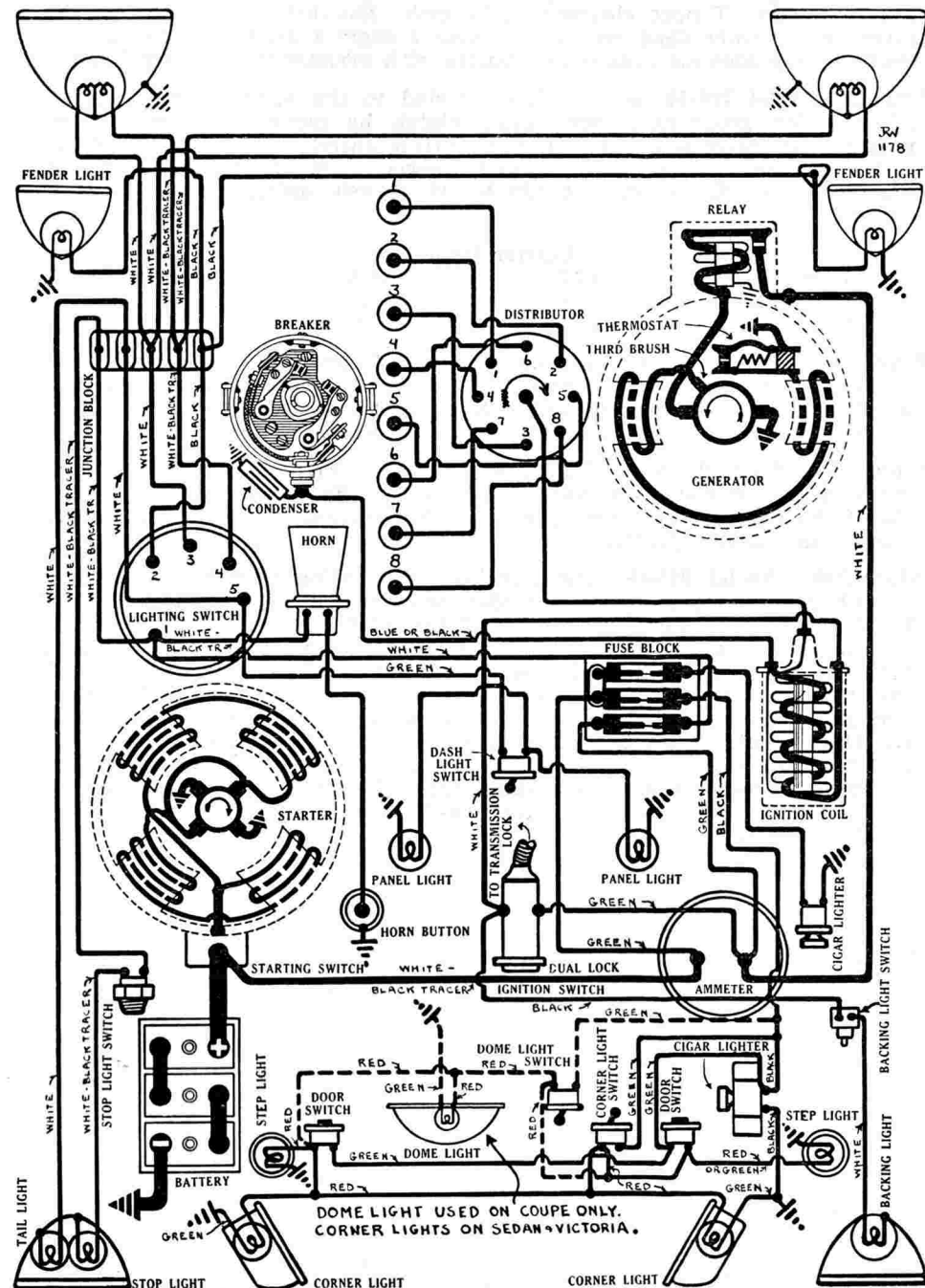
Distributor Model 660-K. Breaker contacts separate .020 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw. Resurface contact when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine). Automatic advance begins at 800 R.P.M. of engine. Maximum automatic advance is 22 degrees, reached at 3200 R.P.M. of the engine. Breaker has two sets of contacts operating on a single four lobe cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head and can be removed from the left side. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down two turns every month or each 1000 miles of operation. Once each month remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil. Put one drop of oil on the breaker arm pivot pins and place a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 1838182, and follow complete directions in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over exactly 90 degrees when piston No. 6 will reach firing position (10 degrees before top dead center with manual spark control fully advanced). If the second set of contacts (mounted on the movable sub-plate) do not begin to open at this point, loosen the lock screws and turn the eccentric adjusting screw until contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .022 and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position 10 degrees before top dead center (measured on the flywheel) with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control (push the spark button all the way in toward the dash) and remove the timing inspection cover plate over the inspection hole in the flywheel housing. Turn engine over until a point 10 degrees before the top dead center mark for cylinders No. 1



REO

MODEL N-30 FLYING CLOUD EIGHT (1931) SERIAL NUMBERS 30N-1 UP MODEL N-35 ROYALE EIGHT (1931) SERIAL NUMBERS 35N-1 UP DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

and 8 is directly opposite the indicator on the flywheel housing. Then loosen the advance arm clamp screw and rotate the distributor until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the clamp screw and see that the distributor head segment opposite the rotor is connected to the spark plug in cylinder No. 1. The second set of contacts open 45 degrees after this point when piston No. 6 reaches firing position.

The engine can also be timed when piston No. 1 reaches a position 15 degrees after top dead center if the manual spark control is retarded by pulling out the spark button on the dash.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. Champion Type C-7. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1 13/16 inches. Stem diameter, .3437 inch. Stem length, 5 3/4 inches. Valve lift, 11/32 inch. Spring pressure, 60 pounds (spring length, 2 3/8 inches), 85 pounds (spring length, 2 1/32 inches). Tappet clearance, .008 inch (hot). Inlet valves open at top dead center and close 50 degrees after lower dead center. Tappet clearance should be set at .012 inch in checking valve timing.

EXHAUST VALVES. Head diameter, 1 11/16 inches. Stem diameter, .3437 inch. Stem length, 5 3/4 inches. Valve lift, 11/32 inch. Spring pressure, 60 pounds (spring length, 2 3/8 inches), 80 pounds (spring length, 2 1/32 inches). Tappet clearance, .008 inch (hot). Exhaust valves open 48 degrees before lower dead center and close 2 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—Model 728-M. Starter is connected to the engine through a mechanical pinion shift and a set of reduction gears. Pinion shift is interconnected with the starting switch pedal. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Brush spring tension is 24-28 ounces. Starter cranks the engine at 80 R.P.M. drawing 200 amperes.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3.25	550

Mounting:—Starter is flange mounted at the left of the engine on the forward face of the flywheel housing. To remove starter, disconnect cable and starting pedal linkage and take out three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in each of the starter bearing oilers every month or each 1000 miles of operation. Every six months or each 5000 miles remove the grease plug in the reduction gear case and repack gears with medium cup grease.

GENERATOR:—Model 955-G. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F.

cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round lock screw on the outside of the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 19-21 amperes at 8.4 volts reached at 1600-1800 R.P.M. or 38-42 M.P.H.

Generator Data					
Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8.5	1450	9-12	7.5	2000

Generator, motoring, draws 5 amperes at 6 volts. Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces.

Mounting:—Generator is flange mounted at right of engine on the rear face of the timing chain case. To remove generator, disconnect lead and take out flange mounting cap screws. Then slide generator to the rear to disengage drive coupling and lift from place. Generator is driven through a slotted tongue coupling by the accessory sprocket which is mounted independently in the chain case. The timing chain tension is adjusted by shifting the generator. To take up timing chain, loosen the three mounting screws and turn up the adjusting set screw until the chain begins to hum with the engine running. Then back off the set screw until the chain runs noiselessly and tighten the mounting screws.

Oiling:—Put 8 or 10 drops of light engine oil in each of the generator bearing oilers every month or each 1000 miles of operation.

RELAY:—Model 265-B. Relay is mounted on the generator field frame. Relay contacts close at 575 R.P.M. when the generator voltage reaches 6.75-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .015-.025 inch. Air gap should be .014-.020 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 482-F. Lighting switch is mounted at the lower end of the steering column. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights (on fenders) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light and backing light are each 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 3 cp. D.C. Mazda 64..

Note:—The N-35 Royale Eight has a separate backing light mounted on the right rear fender as shown on the diagram. This is not used on the N-30 Flying Cloud Eight which uses a separate backing light switch connected across the stop light switch so that the stop light is turned on when the transmission is placed in reverse. (See N-25 Flying Cloud Six wiring diagram for wiring of stop and backing light and body lighting on the N-30.) In all other respects the electrical equipment of the N-30 and N-35 are the same.

FUSES:—Light fuses on fuse block on the dash are 20 ampere capacity.

ROLLS ROYCE

PHANTOM MODEL (1930-31)

ROLLS ROYCE GENERATING, STARTING SYSTEM DE JON IGNITION

BATTERY:—Exide, Type 3-XC-21-1, 6 volt. The positive (+) terminal is grounded at the starting motor. Starting capacity (20 minute rate) is 164 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 30 hours.

IGNITION:—Coil Model CAA-4002 (2 used). Coils are mounted at the left of the engine. Ignition current is 2.5 amperes at 6 volts with engine running and 7.5 amperes at 6 volts with engine stopped. On bench test, each coil draws 2.5 amperes at 6 volts with a distributor R.P.M. of 221. The spark at atmospheric pressure should jump .800 inch between needle points.

Distributor Model IAA-4004. This is a special unit consisting of two complete distributors mounted on a unit base. The forward distributor fires the spark plugs over the exhaust valves and the rear distributor fires the plugs over the inlet valves. Breaker contacts separate .018-.020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Distributor is semi-automatic. Maximum manual advance is 10 degrees (distributor). Automatic advance begins at 400 R.P.M. of crankshaft. Maximum automatic advance is 42 degrees reached at 2500 R.P.M. Both sets of breaker contacts must open at the same instant for satisfactory engine performance.

Mounting:—Ignition coils and distributor units are mounted on the left of the engine. To remove, disconnect manual advance rod and primary leads and remove distributor caps with cables attached. Then remove four hold-down nuts and lift unit from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of each distributor head every 2000 miles. Put one drop of oil on the breaker arm pivot pin after removing the rotor button, every six months. Put a small bit of vaseline on the face of the breaker cam under the fiber bumper of the contact arm every six months.

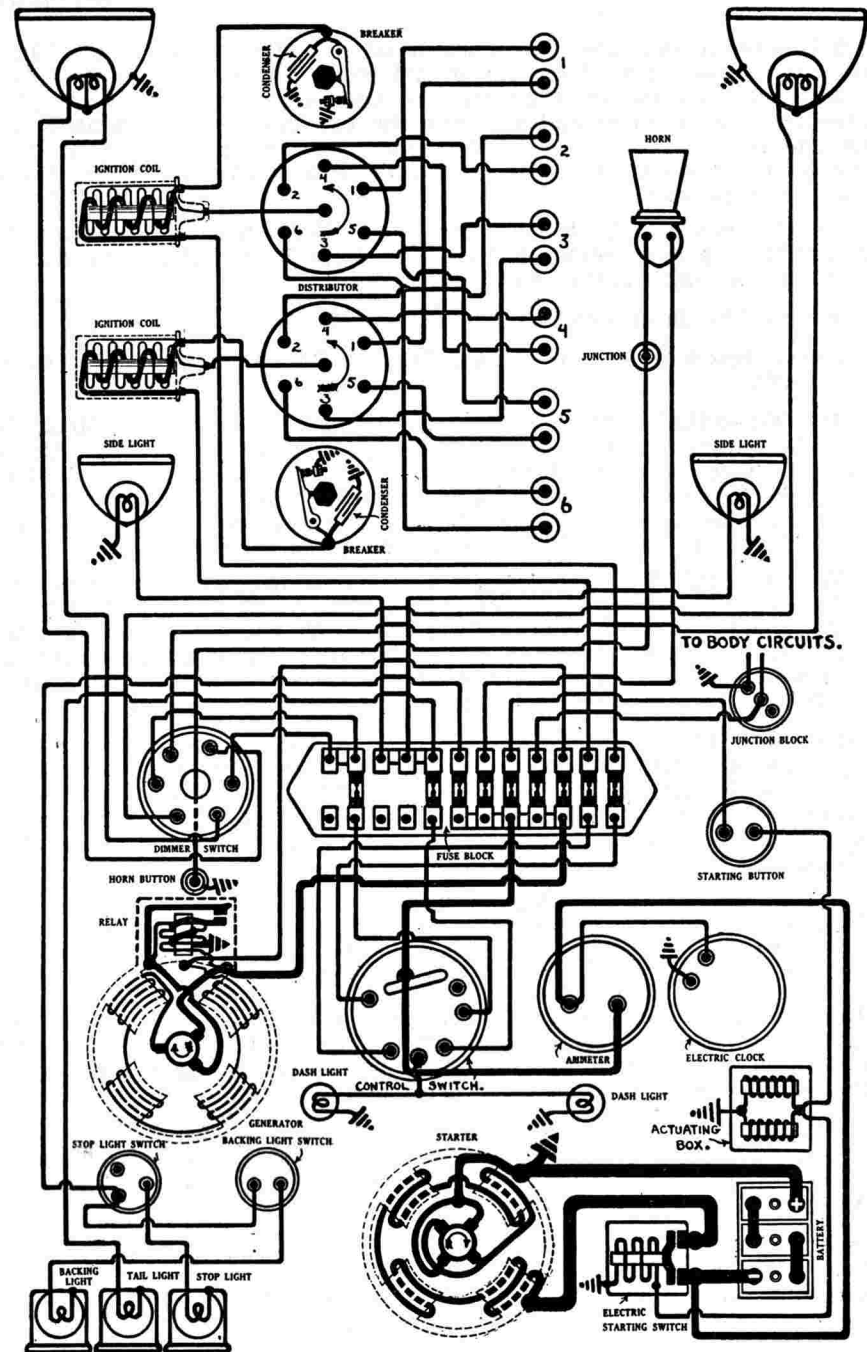
Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position 10 degrees before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke. Fully advance manual spark control and turn engine over until the flywheel mark 'MA' is directly opposite the reference mark on the crankcase above the flywheel. This is the firing position for piston No. 1. Then loosen advance arm clamp screw and rotate distributor housing until contacts begin to open. Both sets of contacts must open at the same instant. Tighten the clamp screw and connect the spark plugs as shown on the diagram.

NOTE:—The arrangement of the spark plugs as shown is correct for all Phantom engines with cast iron heads. The forward distributor fires the plugs over the inlet valves and the rear distributor fires the plugs over the exhaust valves (see diagram). Engines with the aluminum head have one set of spark plugs on each side of the engine. The forward distributor fires the plugs on the right side of the head and the rear distributor fires the plugs on the left side of the head.

Firing Order:—The firing order is 1-4-2-5-3-6.

Spark Plugs:—Spark plugs are 18 MM. Metric. Longbody. Gaps should be .030 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1.900 inches. Stem diameter, .433 inch. Stem length, 4.450 inches. Valve lift, .425 inch. Spring pressure, 75 pounds (valve closed). Tappet clearance, .004 inch hot (alumi-



ROLLS ROYCE

PHANTOM MODEL (1930-31)

ROLLS ROYCE GENERATING, STARTING SYSTEM DE JON IGNITION

num heads). Inlet valves open 14 degrees after top dead center and close 30 degrees after lower dead center (with .020 inch tappet clearance).

EXHAUST VALVES. Head diameter, 1.900 inches. Stem diameter, .433 inch. Stem length, 4.450 inches. Valve lift, .425 inch. Spring pressure, 75 pounds (valve closed). Tappet clearance, .004 inch hot (aluminum head). Exhaust valves open 34 degrees before lower dead center and close 2 degrees before top dead center with a tappet clearance of .020 inch.

NOTE:—Tappet clearance should always be set at .020 inch in checking valve timing. The flywheel is marked 'TDC', 'BDC', 'IO', 'IC', 'EO', 'EC', the ignition mark 'MA'. The inlet closing point is recommended for use in checking valve setting. Valve stem guides are removable. Valves with over-size stems are not made.

STARTER:—Part No. A-9860. Starter is connected to the engine through a chain and drives through transmission. Starter is engaged through an electromagnetic clutch. The direction of rotation is clockwise, viewed from the commutator end. Starter cranks the engine at 86 R.P.M. Brush spring tension is 12-14 ounces. Main starter switch is Model A-2644. Push button switch is Model G-5560.

Starter Data			
Torque	R.P.M.	Volts	Amperes
24 lb. ft.....	Lock.....	3.8.....	750

Mounting:—Starter is mounted at right of transmission case under the floor boards of the front compartment. To remove starter, remove floor boards and disconnect battery cable and drive chain. Then remove caps from two mounting brackets and lift starter from place.

Oiling:—Starter front bearing is oiled from the chassis lubricating system. Put 4 or 5 drops of light oil in rear bearing oiler every six months.

GENERATOR:—Part No. A-9547. The direction of rotation is clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, rotate generator end plate in a clockwise direction to increase charging rate and in a counter-clockwise direction to decrease charging rate. With maximum third brush setting, generator output is 26 amperes at 9 volts reached at 1450 R.P.M.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
20.....	8.25.....	1350	17.....	8.75.....	1460

Main brush spring tension is 8-10 ounces. Third brush spring tension is 6-8 ounces. Shunt field current is 2.5 amperes at 4 volts.

Mounting:—Generator is mounted at left of engine. To remove generator, disconnect leads and drive coupling and loosen mounting strap. Then lift generator from place.

Oiling:—Generator bearings are oiled from central chassis lubricating system.

CUTOUT:—Part No. A-10194. Cutout is mounted on the generator. Contacts close at 450-475 R.P.M. with a generator voltage of 6.75 volts and open at 400 R.P.M. with a discharge current of 3 amperes. Cutout contacts separate .030 inch. Air gap is .025 inch with contacts open and .012 inch with contacts closed. Cutout is adjusted by turning nut on armature spring.

LIGHTING:—Rolls Royce Part No. A-14527. Switch is mounted on the instrument board. There is a separate dimmer switch. Head lamps are 6-8 volt, 21 cp. double filament Mazda No. 1110. Side lamps are 6-8 volt, 3 cp. S.C. Mazda No. 63. Instrument board lamps are 6-8 volt, 2 cp. D.C. Mazda No. 64. Tail lamps are 6-8 volt, 3 cp. S.C. Mazda No. 63. Stop and backing lamps are 6-8 volt, 21 cp. S.C. Mazda No. 1129.

FUSES:—Generator field fuse is 10 amperes. Lighting fuses are 10 amperes.

RUXTON

MODEL C (1930-31) SERIAL NUMBERS 1001 UP CONTINENTAL 18-S ENGINE AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

The Ruxton is a front wheel drive car and the engine is reversed in the chassis with the flywheel at the forward end. The crankshaft rotates counter-clockwise as viewed from the front. In other respects the engine is similar to regular designs used in rear wheel drive cars and the electrical units are all standard types. The starter drives the engine through a ring gear on the flywheel at the forward end of the engine. The timing chain case is at the rear of the engine and the generator is mounted on the forward face of the timing chain case. The water pump is driven by an extension of the generator shaft through a flexible hose coupling. The battery is mounted in a battery box placed under the hood at the right of the engine.

BATTERY:—Willard, GRR-5C-BD, 6 volt. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 166 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 31 hours. Battery is mounted under the hood at the right of the engine.

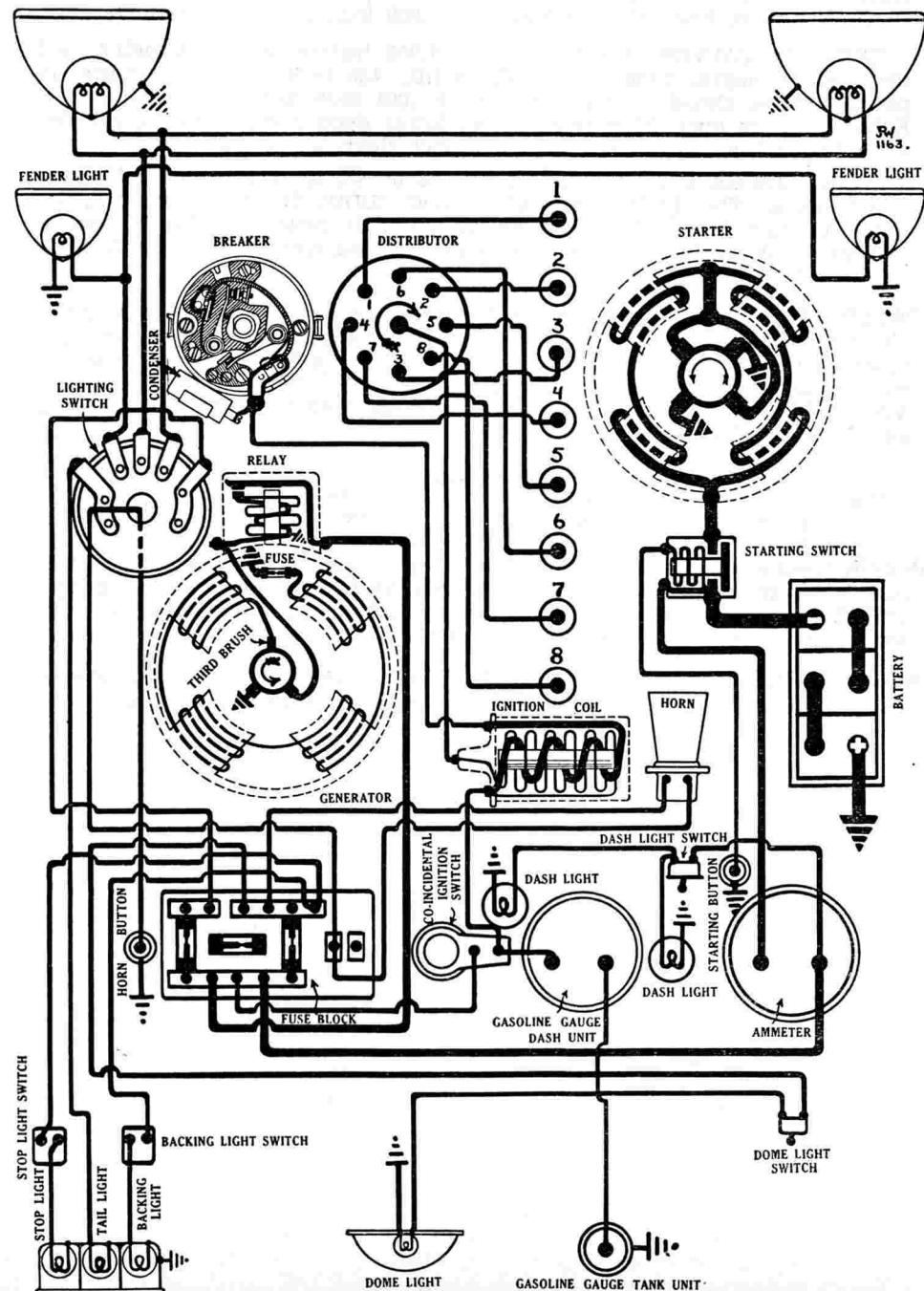
IGNITION:—Coil Model CE-4001. Coil is mounted on the engine side of the dash. Ignition current is 1-3 amperes at 6 volts with engine running and 3-4.5 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' type co-incidental ignition switch and steering post lock.

Distributor Model IGH-4005-A. Breaker contacts separate .020-.022 inch. Set contact gap (first set mounted on breaker plate) by loosening lock screws on stationary contact mounting plate and turning up eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. The second set of contacts (mounted on movable sub-plate) are adjusted by loosening lock nut on stationary contact mounting stud and turning up the the stud. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 10 degrees. Maximum automatic advance is 15 degrees. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the commutator end of the generator at the left of the engine. To remove distributor, disconnect primary lead and manual spark control and remove distributor head with cables intact. Then take out mounting screw in advance arm and lift distributor from place.

Oiling:—Put 6 or 8 drops of light engine oil in the oiler on the side of the distributor every 500 miles of operation. Every 1000 miles remove the distributor head and rotor and put 3 or 4 drops of oil in the oiler in the center of the shaft and put one drop of oil on the breaker arm pivot pins. Every 5000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—**Synchronization of Contacts.** Synchronize contacts on a rotary spark gap or use special Auto-Lite tool, Part No. IGH-1, and master timing rotor and follow complete directions in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over 90 degrees when piston No. 6 will reach firing position. If the second set of contacts do not open at this point, loosen the two lock screws and shift the movable sub-plate until the contacts begin to open. Tighten the lock screws and check the contact gap.



RUXTON

MODEL C (1930-31) SERIAL NUMBERS 1001 UP

CONTINENTAL 18-S ENGINE

AUTO-LITE GENERATING, STARTING SYSTEM

AUTO-LITE IGNITION

Timing Distributor to Engine. Breaker contacts begin to open when the flywheel mark 'IGN' is directly opposite the indicator with piston No. 1 entering power stroke. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control and remove the timing inspection cover on the flywheel housing. Turn the engine over until the ignition mark 'IGN' which is stamped on the flywheel before the top dead center mark 'DC' is directly opposite the indicator on the housing. Then loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted on the breaker plate) begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1. The second set of contacts (mounted on the movable sub-plate) open 45 degrees after this point.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4 (No. 1 cylinder nearest the radiator).

Spark Plugs:—Spark plugs are 18 MM. Metric AC, Part No. 841324. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1½ inches. Stem diameter, .3095-.3085 inch. Stem length, 5 33/64 inches. Valve lift, 5/16 inch. Spring pressure, 103 plus or minus 3 pounds (valve open). Tappet clearance, .006-.008 inch (hot). Inlet valves open 8 degrees after top dead center and close 40 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1¾ inches. Stem diameter, .3095-.3085 inch. Stem length, 5 33/64 inches. Valve lift, 5/16 inch. Spring pressure, 103 plus or minus 3 pounds (valve open). Tappet clearance, .006-.008 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 8 degrees after top dead center. Valve stem guides are removable. Valves are furnished with oversize stems .3240-.3235 inch diameter.

NOTE:—The flywheel is marked '#1 E.C.' at a point 8 degrees after the top dead center mark 'DC'. This is the inlet opening and exhaust closing point for cylinder No. 1.

STARTER:—**Model MUA-4007.** Starter is connected to the engine through a set of reduction gears and an outboard Bendix drive. The direction of rotation is counter-clockwise (armature shaft), viewed from the commutator end. Brush spring tension is 24-28 ounces. The starting switch is mounted on the starter. Switch is of electro-magnetic type and is controlled by a starting button on the instrument panel.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	4200	6	50
2 "	1500	5.3	130
4 "	1000	5.0	200
6 "	600	4.6	275
8 "	450	4.2	340
22 "	Lock	3.6	480

Mounting:—Starter is flange mounted at the right of the engine on the rear of the flywheel housing. To remove starter, disconnect cable and starting switch leads and take out flange mounting cap screws. Then pull starter to the rear to clear drive and lift from place.

Oiling:—Starter bearings are oilless. They require no attention.

GENERATOR:—**Model GAG-4121.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The third brush mounting plate is held in position by friction between the mounting stud and the end plate. With standard car setting the maximum charging rate is 16 amperes (cold) at 8 volts reached at 1300 R.P.M. or 25 miles per hour.

Generator Data		
Amperes	Volts	R.P.M.
0	6.4	475
4	6.75	575
8	7.1	700
12	7.45	850
16	7.8	1050
18	8.0	1300

Shunt field current is 3.9-4.4 amperes at 6 volts. Generator, motoring, draws 4.75-5.25 amperes at 6 volts. Brush spring tension is 24-32 ounces. A five ampere field fuse is connected in the field circuit.

Mounting:—Generator is flange mounted at the left of the engine and is driven from the chain case at the rear. To remove generator, disconnect lead and all ignition wiring or remove distributor. Then loosen adjustment set screw and take out flange mounting cap screws. Disconnect water pump drive coupling. Pull generator forward to disconnect drive coupling and lift from place.

Timing Chain Adjustment. The timing chain tension is adjusted by shifting the generator. To adjust chain, loosen the flange mounting screws and turn up the adjustment set screw until the chain begins to hum with the engine running. Back off the set screw until the chain runs noiselessly and tighten the flange mounting screws and set screw lock nut.

Oiling:—Put 5 or 6 drops of light engine oil in the generator oiler every 1000 miles of operation.

RELAY:—**Model CB-4012.** Relay is mounted on the generator. Relay contacts close at 650 R.P.M. when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—**Soreng-Manegold Switch Model 2560-A.** Lighting switch is mounted at the lower end of the steering column. Headlights are equipped with double filament bulbs using a depressed 21 cp. filament beam instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop and backing lights are 6-8 volt, 21 cp. S.C. Mazda 1129. Dash, tail and dome lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

FUSES:—Generator field fuse mounted on field frame is 5 ampere capacity. Lighting fuses mounted on junction block on dash are each 15 ampere capacity.

STUDEBAKER SIX

MODEL 53 (1930) NEW MODEL 54 (1931)
DELCO-REMY GENERATING STARTING SYSTEM
DELCO-REMY IGNITION

BATTERY:—Willard, Type WJ-1-11, 6 volt, 90 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 16 hours. Battery is mounted on the right frame member under the right front seat.

IGNITION:—Coil Model 533-V. The ignition switch is built in the base of the coil. Coil is mounted on the dash with the ignition switch extending through to the face of the instrument panel. Ignition current is .5-2.5 amperes at 6 volts with engine running and 4 amperes at 6 volts with engine stopped.

Distributor Model 639-J. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on crescent shaped stationary contact mounting plate and turning eccentric adjusting screw until gap is .020 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 15 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 30 degrees reached at 2400 R.P.M. of engine.

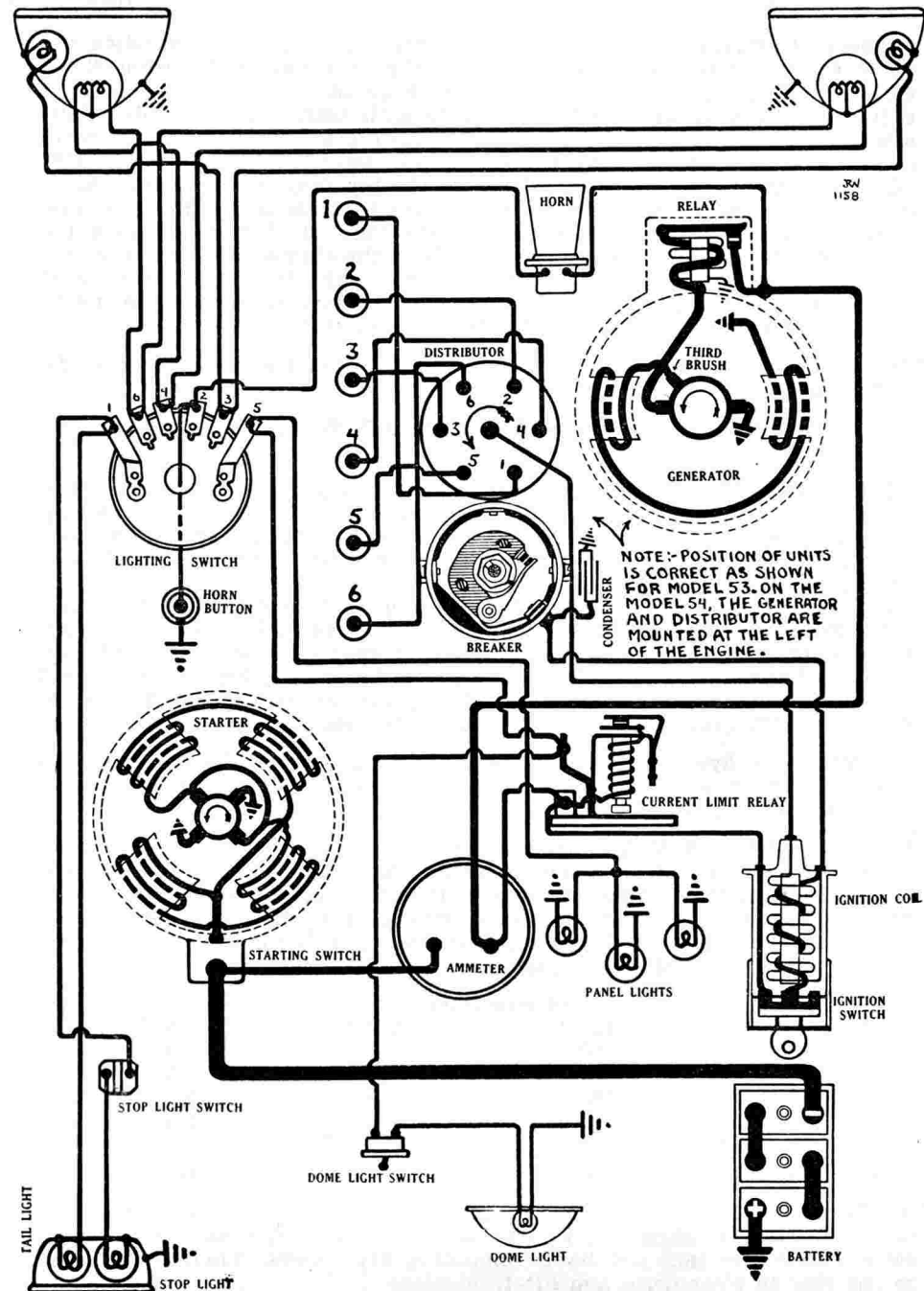
Mounting:—(Model 53). Distributor is mounted on accessory bracket at right of engine. To remove distributor, disconnect primary lead and manual advance rod and remove distributor head with cables intact. Then take out stop screw on advance arm and lift distributor from place.

(Model 54). Distributor is mounted at the left of the engine and is driven by an inclined shaft from the camshaft. To remove distributor, disconnect primary lead and manual spark control and remove distributor cap with cables intact. Then take out hold-down screw and lift distributor from place.

Oiling:—Fill the grease cup on the side of the distributor shaft with medium cup grease and turn down two turns every six weeks or each 2500 miles. At the same time remove the distributor head and rotor and put 4 or 5 drops of light engine oil in the wickoller in the center of the shaft and put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position $7\frac{1}{2}$ degrees or $\frac{1}{2}$ inch (on the flywheel) before top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance spark control lever and see that distributor is rotated clockwise to the full extent of the advance arm slot. Remove cover over inspection hole in the flywheel housing and turn engine over until the punch marks on the flywheel (which are $\frac{1}{2}$ inch or $7\frac{1}{2}$ degrees before the top dead center mark 'U-D-C-1-6') are directly in line with the indicator on the flywheel housing. Then loosen advance arm clamp screw and rotate distributor until the contacts begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs in order 4-2-6-3-5 counter-clockwise around the distributor head.

The engine can be timed on top dead center with the flywheel mark 'U-D-C-1-6' opposite the indicator if the spark control lever is advanced exactly one half. Place the spark lever midway between the fully retarded and fully advanced positions and crank engine over until the dead center mark is opposite the indicator. Piston No. 1 will be on top dead center entering power stroke and the breaker contacts should open at this point.



STUDEBAKER SIX

MODEL 53 (1930) NEW MODEL 54 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

Firing Order:—The firing order is 1-4-2-6-3-5.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Standard Champion No. 4. Gaps are .020 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, $1\frac{5}{8}$ inches. Stem diameter, $\frac{5}{16}$ inch. Stem length, $5\frac{3}{8}$ inches. Valve lift, $\frac{5}{16}$ inch. Spring pressure, 63-68 pounds (valve closed). Tappet clearance, .004 inch. Inlet valves open 5 degrees after top dead center and close 53 degrees after lower dead center.

EXHAUST VALVES. Head diameter, $1\frac{1}{2}$ inches. Stem diameter, $\frac{5}{16}$ inch. Stem length, $5\frac{3}{8}$ inches. Valve lift, $\frac{5}{16}$ inch. Spring pressure, 63-68 pounds (valve closed). Tappet clearance, .006 inch. Exhaust valves open 38 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 718-L.** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Starter cranks the engine at 1050 R.P.M. (armature speed) drawing 275 amperes. Brush spring tension is 24-28 ounces. The starting switch is mounted on the starter field frame and is operated through a flexible control by a button on the dash.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	65
15 "	Lock	3.2	575

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and starting switch control and take out the flange mounting bolts and cap screw. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every six weeks or each 2500 miles. The drive end bearing is oilless.

GENERATOR:—**Model 955-U (53), 943-J (54).** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, loosen the small round headed screw on the end plate and remove the commutator cover band. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 10-12 amperes (hot) reached at 1650 R.P.M. or 20.7 miles per hour.

Generator Data

Cold Test		Hot Test	
Amperes	Volts	Amperes	Volts
15-17	8.0	11-14	7.55-7.85
	R.P.M.		R.P.M.
	1400		1700-1800

Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces. Generator motoring, draws 5.5 amperes at 6 volts.

Mounting:—(**Model 53**). Generator is flange mounted at right of engine at rear of accessory bracket. To remove generator, disconnect lead and take out three flange mounting cap screws. Then pull generator to rear to disengage drive coupling and lift from place.

(**Model 54**). Generator is mounted at the left of the engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then take out bolts under generator forming bracket hinge and lift generator from place. The fan belt tension is adjusted by loosening the adjustment and hinge bolts and swinging the generator away from the engine. Tighten the adjustment bolt after making this adjustment. The belt tension should be just sufficient to drive the generator and fan without slipping.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every six weeks or each 2500 miles.

RELAY:—**Model 265-B.** Relay is mounted on the generator. Relay contacts close at 600 R.P.M. or 7.5 miles per hour when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9115.** Lighting switch is mounted at lower end of steering column. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights (in headlights) are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dome light is 6-8 volt, 6 cp. S.C. Mazda 81.

CURRENT LIMIT RELAY:—**Model 410-F.** This device is a vibrating circuit breaker mounted on the dash and connected in the lighting circuits to protect them against overload and short-circuits. The circuit breaker begins to vibrate when the current reaches 25-30 amperes and continues to vibrate limiting the current to 2-15 amperes. Contact gap is .012-.030 inch. Air gap is .015-.030 inch with contacts closed.

STUDEBAKER

DICTATOR EIGHT MODEL 61 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WJ-4-15. 6 volt, 128 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 145 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 25.6 hours. Battery is mounted on the left frame member under the front compartment floor boards.

IGNITION:—Coil Model 533-Y. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is $\frac{1}{2}$ -2 $\frac{1}{2}$ amperes at 6 volts with engine running and 4-5 amperes at 6 volts with engine stopped.

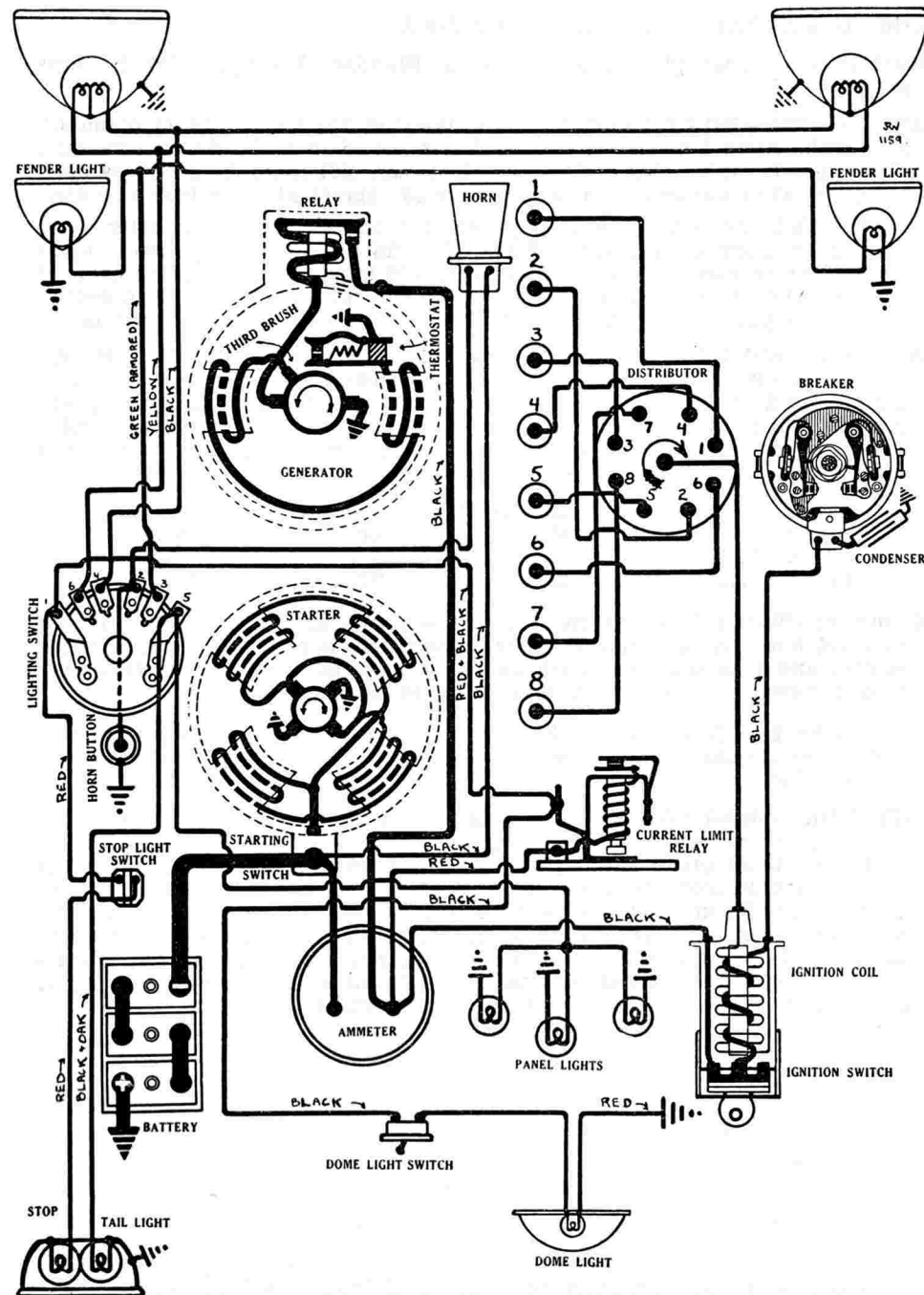
Distributor Model 658-Z. Breaker contacts separate .022 inch. Set breaker gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 22 degrees (engine) reached at 2800 R.P.M. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual advance rod and primary lead and remove distributor head with cables intact. Then loosen advance arm clamp screw and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down two turns every six weeks or each 2500 miles of operation. At the same time remove the distributor head and rotor, oil the wick oiler in the center of the shaft with light engine oil and put a drop of oil in the breaker arm pivot pins. Put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 820738, and follow complete directions in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking over exactly 90 degrees from firing position of piston No. 1 when firing position of No. 6 piston will be reached (one inch before top dead center with spark fully advanced. The punch mark on the flywheel one inch before the top dead center mark 'UDC.3-6' will be opposite the pointer on the flywheel housing). If the second set of contacts (mounted on the movable sub-plate) do not open at this point, loosen the two lock screws and turn the eccentric adjusting screw on the sub-plate until the contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position one inch (on the flywheel) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance the manual spark control lever and remove the inspection cover plate on the flywheel hous-



STUDEBAKER

DICTATOR EIGHT MODEL 61 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

ing at the right of the engine. Crank engine over until the punch mark on the flywheel one inch before the top dead center mark 'UDC.1-8' is directly opposite the pointer in the inspection hole in the flywheel housing. Then loosen advance arm clamp screw and rotate distributor until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the clamp screw and see that the distributor segment directly opposite the rotor is connected to the spark plug in cylinder No. 1. Connect spark plugs as indicated in the diagram. The second set of contacts (mounted on the movable sub-plate) should open 45 degrees after this point when the punch mark one inch before top dead center mark 'UDC.3-6' is opposite the indicator. This is the firing position of piston No. 6.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Std. Champion No. 4. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 $\frac{13}{32}$ inches. Stem diameter, $\frac{5}{16}$ inch. Stem length, 5 $\frac{7}{32}$ inches. Valve lift, $\frac{9}{32}$ inch. Spring pressure, 63-68 pounds (valve closed). Tappet clearance, .004 inch (hot). Inlet valves open at top dead center and close 40 degrees after lower dead center. The flywheel is marked 'UDC.1-8' at point of inlet opening of cylinder No. 1.

EXHAUST VALVES. Head diameter, 1 $\frac{9}{32}$ inches. Stem diameter, $\frac{5}{16}$ inch. Stem length, 5 $\frac{7}{32}$ inches. Valve lift, $\frac{9}{32}$ inch. Spring pressure, 63-68 pounds (valve closed). Tappet clearance, .006 inch (hot). Exhaust valves open 45 degrees before lower dead center and close 11 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 718-Q.** Starter is connected to the engine through an out-board Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces. Starter switch is mounted on the starter field frame and is controlled through a flexible wire control by a button on the dash.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	65
15 "	Lock	3.15	570

Mounting:—Starter is flange mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect cable and starting switch control and take out three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every six weeks or each 2500 miles of operation. The drive end bearings are oilless.

GENERATOR:—**Model 955-C.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust the generator output, remove the commutator cover band and loosen the small round headed lock screw on the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 19 amperes (cold) reached at 1450 R.P.M. or 22-25 M.P.H.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
19-21	8.35-8.5	1450	9-12	7.35-7.65	2000

Shunt field current is 4-6.1 amperes at 6 volts. Generator draws 5.5 amperes at 6 volts when running as a motor. Brush spring tension is 14-18 ounces.

Mounting:—Generator is cradle mounted on a special bracket at the left of the engine and is driven by the fan belt. The water pump is driven by an extension of the generator shaft. To remove the generator, disconnect the water pump drive coupling and relay lead and loosen mounting clamp band. Slip off drive belt and slide generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every six weeks or each 2500 miles of operation.

RELAY:—**Model 265-B.** Relay is mounted on the generator field frame. Relay contacts close at 550 R.P.M. or 7-10 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 1-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9115.** Lighting switch is mounted at the lower end of the steering column. Double filament headlight bulbs are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights (for parking) are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome light is 6-8 volt, 6 cp. S.C. Mazda 81.

CURRENT LIMIT RELAY:—**Model 410-F.** This is a vibrating circuit breaker mounted on the dash and connected in the lighting lines to protect them from overload and short circuits. The circuit breaker begins to vibrate when the current reaches 30-35 amperes and continues limiting the current to 5-18 amperes. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch. Spring tension should be 5 ounces minimum.

STUDEBAKER

COMMANDER EIGHT MODEL 70 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WJ-4-15. 6 volt, 128 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 145 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 25.6 hours. Battery is mounted on the left frame member under the front compartment floor boards.

IGNITION:—Coil Model 528-E. Coil is mounted on the dash. Ignition current is $\frac{1}{2}$ -2 $\frac{1}{2}$ amperes at 6 volts with engine running and 4-5 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' type co-incidental steering post and ignition switch lock.

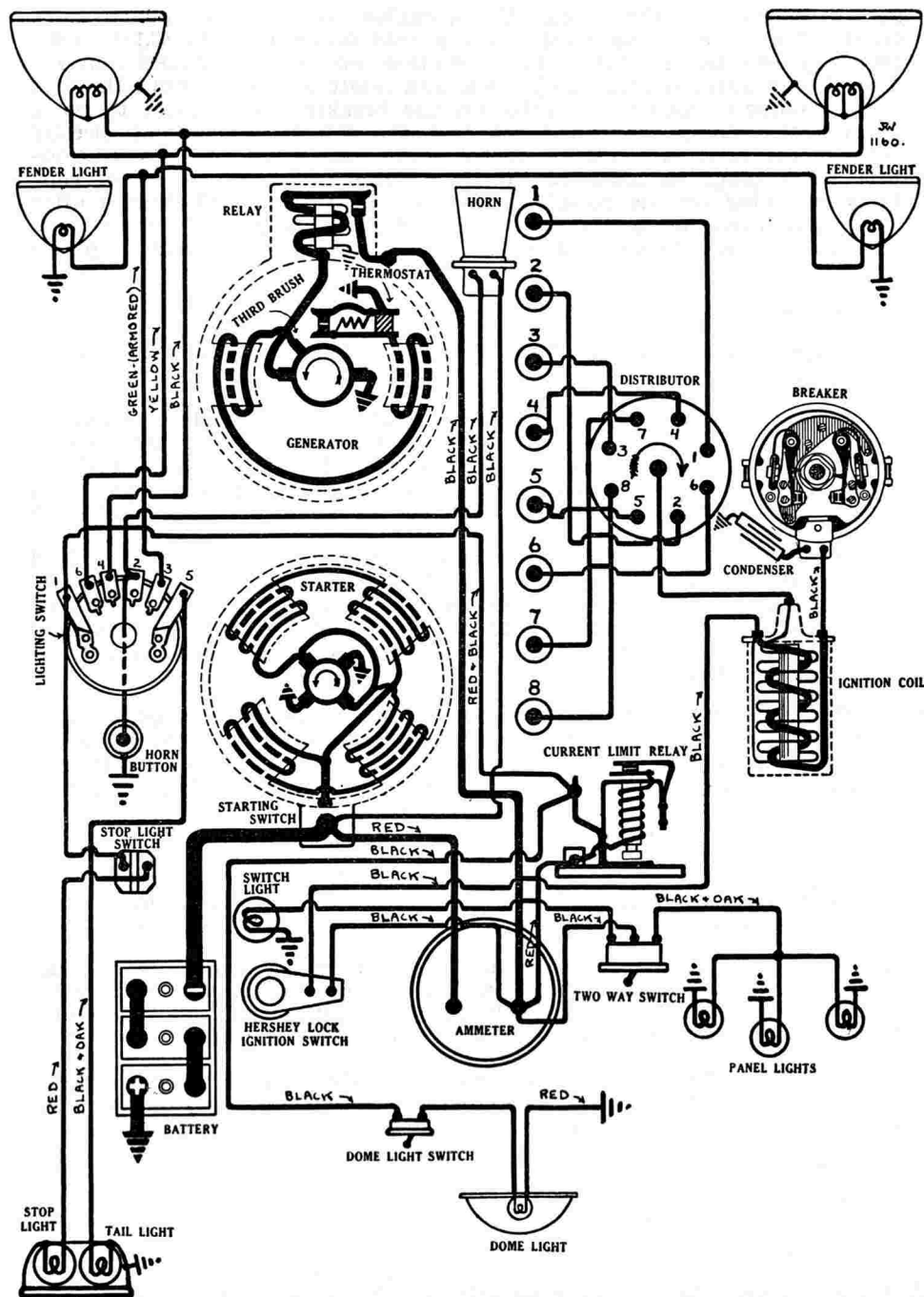
Distributor Model 658-Z. Breaker contacts separate .018-.024 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw until gap is .022 inch with breaker arm on lobe of cam. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 22 degrees (engine) reached at 2800 R.P.M. Breaker has two sets of contacts operating on a single four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual advance rod and primary lead and remove distributor head with cables intact. Then loosen clamp screw on advance plate and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down two turns every six weeks or each 2500 miles of operation. At the same time remove the distributor head and rotor and put a drop of light engine oil on the breaker arm pivot pins and oil the wick oiler in the center of the shaft. Put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 820738, and follow complete directions in Equipment Section. Contacts can be synchronized without special equipment after the distributor has been timed to the engine by cranking the engine over 90 degrees when piston No. 6 will reach firing position ($\frac{3}{4}$ inch on the flywheel before top dead center when the punch mark on the flywheel which is $\frac{3}{4}$ inch before the top dead center mark 'UDC.3-6' will be opposite the indicator. The manual spark control must be fully advanced). If the second set of contacts (mounted on the movable sub-plate) do not open at this point, loosen the two lock screws and turn the eccentric adjusting screw until the contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch, reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position $\frac{3}{4}$ inch (on the flywheel) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance manual spark control and remove the timing inspection hole cover on the top of the flywheel housing at the right of the engine. Then crank engine over until the punch mark which is $\frac{3}{4}$ inch before the top dead center mark 'UDC.1-6'



STUDEBAKER

COMMANDER EIGHT MODEL 70 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

is directly opposite the pointer on the housing. Then loosen the advance arm clamp screw and rotate the distributor until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1. The second set of contacts should open exactly 45 degrees after this point with piston No. 6 at firing position when the punch mark $\frac{3}{4}$ inch before the top dead center mark 'UDC.3-6' will be directly opposite the indicator.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Std. Champion No. 4. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 $\frac{13}{32}$ inches. Stem diameter, $\frac{5}{16}$ inch. Stem length, 5 $\frac{7}{32}$ inches. Valve lift, $\frac{11}{32}$ inch. Spring pressure, 63-68 pounds (valve closed). Tappet clearance, .004 inch (hot). Inlet valves open 10 degrees before top dead center and close 43 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 $\frac{9}{32}$ inches. Stem diameter, $\frac{5}{16}$ inch. Stem length, 5 $\frac{7}{32}$ inches. Valve lift, $\frac{11}{32}$ inch. Spring pressure, 63-68 pounds (valve closed). Tappet clearance, .006 inch (hot). Exhaust valves open 48 degrees before lower dead center and close 10 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 718-Q.** Starter is connected to the engine through an out-board Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 25-28 ounces. Starter switch is mounted on the starter field frame and is operated through a flexible control by a button on the dash.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	65
15 "	Lock	3.15	570

Mounting:—Starter is flange mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect cable and starter switch control and take out three flange mounting cap screws. Then pull starter forward to clear the Bendix drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every six weeks or each 2500 miles of operation. The drive end bearing is oilless.

GENERATOR:—**Model 955-C.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third

brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the round headed lock screw on the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. With standard car setting the maximum charging rate is 19 amperes (cold) reached at 1450 R.P.M. or 22-25 M.P.H.

Generator Data					
Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
19-21	8.35-8.5	1450	9-12	7.35-7.65	2000

Shunt field current is 4-6.1 amperes at 6 volts. Brush spring tension is 14-18 ounces. Generator draws 5.5 amperes at 6 volts operating as a motor.

Mounting:—Generator is cradle mounted on special mounting bracket at the left of the engine and is driven by the fan belt. The water pump is driven by an extension of the water pump shaft. To remove generator, disconnect water pump drive coupling and relay lead and loosen mounting clamp band. Then slip off drive belt and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every six weeks or each 2500 miles of operation.

RELAY:—**Model 265-B.** Relay is mounted on the generator field frame. Relay contacts close at 550 R.P.M. or 7-10 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 1-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Switch Model 9115.** Lighting switch is mounted at the lower end of the steering column. Double filament headlight bulbs are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights (for parking) are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome light is 6-8 volt, 6 cp. S.C. Mazda 81.

CURRENT LIMIT RELAY:—**Model 410-F.** This is a vibrating circuit breaker mounted on the dash and connected in the lighting circuits to protect them from overload or short circuits. Circuit breaker begins to vibrate when the current reaches 30-35 amperes and continues limiting the current to 5-18 amperes. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch with contacts closed. Spring tension is 5 ounces minimum.

STUDEBAKER

PRESIDENT EIGHT MODELS 80 AND 90 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Willard, Type WJ-4-15, 6 volt, 128 ampere hour. The positive (+) terminal is grounded. Starting capacity (20 minute rate) is 145 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 25.6 hours. Battery is mounted on the right frame member under the floor boards of the front compartment.

IGNITION:—Coil Model 528-E. (2 used). Coils are mounted on the dash. Ignition current (each coil) is $\frac{1}{2}$ -2 $\frac{1}{2}$ amperes at 6 volts with engine running and 4-5 amperes at 6 volts with engine stopped. The ignition switch is an Oakes 'Hershey' type co-incidental steering post and ignition switch lock.

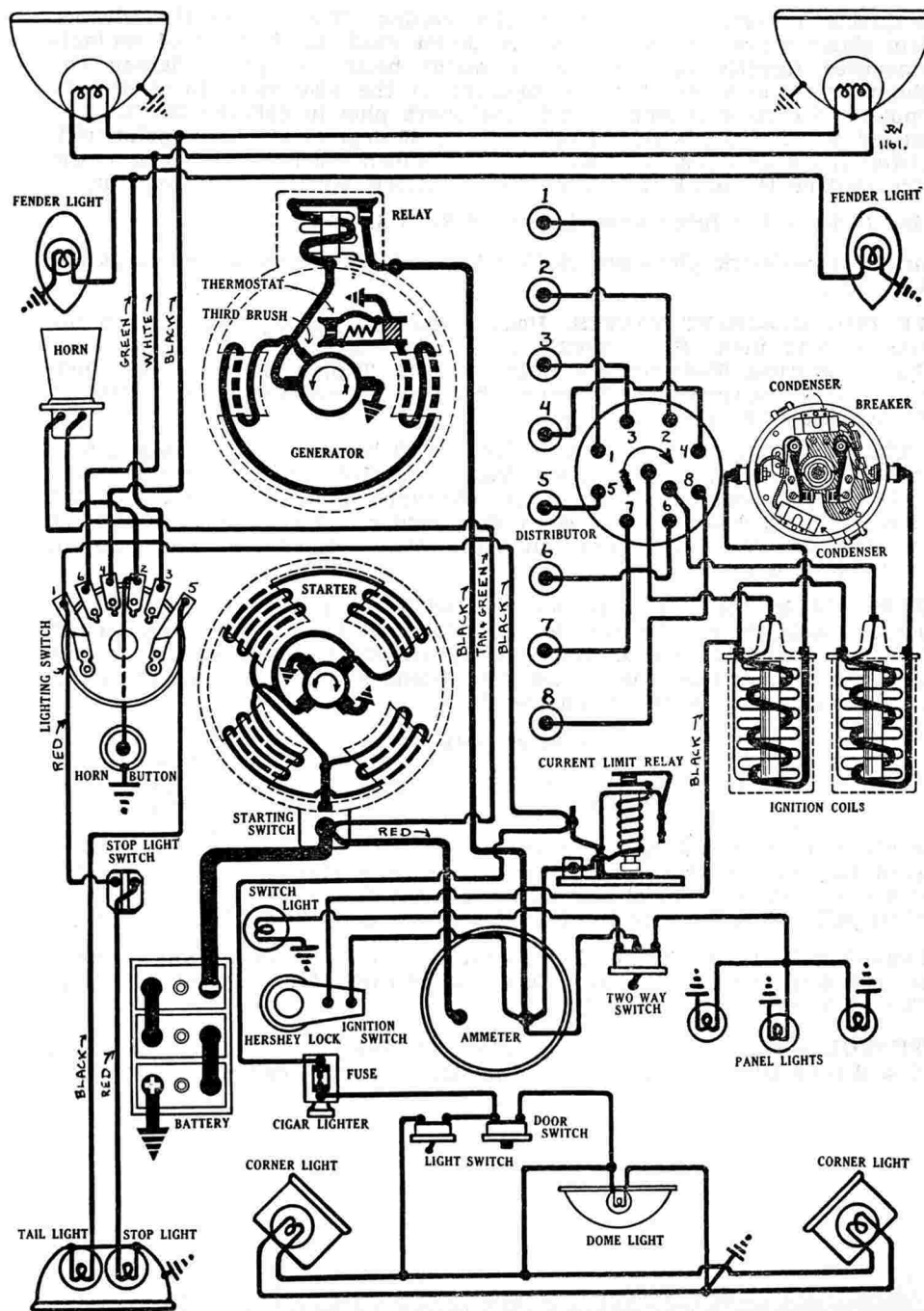
Distributor Model 668-C. Breaker contacts separate .018-.022 inch. Set contact gap by loosening lock screw on stationary contact mounting plate and turning up eccentric adjusting screw until gap is .022 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 25 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 19 degrees (engine) reached at 3200 R.P.M. Breaker has two sets of contacts operating on a single four sided cam. Each set of contacts controls one ignition coil and fires the spark plugs in four cylinders. Contacts separate alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. This firing interval must be accurately set by synchronizing contacts for satisfactory engine performance. See Timing.

Mounting:—Distributor is mounted on the cylinder head. To remove distributor, disconnect manual advance control rod and primary leads and remove distributor head with cables intact. Then loosen arm clamp screw and lift distributor from place.

Oiling:—Fill the grease cup under the distributor head with medium cup grease and turn down two turns every six weeks or each 2500 miles of operation. At the same time remove the distributor head and rotor and oil the wick oiler in the center of the shaft with light engine oil. Put one drop of oil on the breaker arm pivot pins and put a small bit of vaseline on the face of the breaker cam.

Timing:—Synchronization of Contacts. Synchronize contacts on a rotary spark gap or use special Delco-Remy tool, Part No. 1835009, and follow complete directions in Equipment Section. Contacts can be synchronized without special equipment after distributor has been timed to the engine by cranking engine over 90 degrees when piston No. 6 will reach firing position (one inch on the flywheel before top dead center with the punch mark on the flywheel which is one inch before top dead center mark 'UDC.1-8' directly opposite the indicator. The manual spark control must be fully advanced). If the second set of contacts (mounted on the movable sub-plate) do not open at this point, loosen the two lock screws and turn the eccentric adjusting screw until the contacts begin to open. Tighten the lock screws and check the contact gap. If outside limits of .018-.024 inch reset at .022 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position one inch before top dead center (measured on the flywheel) with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance manual spark control and remove the timing inspection hole cover plate



STUDEBAKER

PRESIDENT EIGHT MODELS 80 AND 90 (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

on the flywheel housing at the right of the engine. Crank engine over until the punch mark on the flywheel which is one inch before top dead center mark 'UDC.1-8' is directly opposite the indicator on the housing. Then loosen the advance arm clamp screw and rotate the distributor until the first set of contacts (mounted directly on the breaker plate) begin to open. Tighten the clamp screw and see that the segment in the distributor head directly opposite the rotor is connected to the spark plug in cylinder No. 1. Connect the remaining spark plugs in accordance with the diagram. Note that connections do not follow the firing order of the engine.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4. Spark plugs are connected 1-3-2-4-8-6-7-5 clockwise around the distributor head.

Spark Plugs:—Spark plugs are 7/8-18 S.A.E. Std. Champion No. 4. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 21/32 inches. Stem diameter, 3/8 inch. Stem length, 5 19/32 inches. Valve lift, 11/32 inch. Spring pressure 98-108 pounds (valve open). Tappet clearance, .004 inch (hot). Inlet valves open 5 degrees after top dead center and close 45 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 9/16 inch. Stem diameter, 3/8 inch. Stem length, 5 19/32 inches. Valve lift, 11/32 inch. Spring pressure, 98-108 pounds (valve open). Tappet clearance, .006 inch (hot). Exhaust valves open 40 degrees before lower dead center and close 12 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model 728-C.** Starter is connected to the engine through a set of reduction gears and a manually operated pinion shift interconnected with the starting switch. The direction of rotation is clockwise (armature shaft), viewed from the commutator end. Brush spring tension is 24-28 ounces. Starter switch is mounted on the starter field frame.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	2500	5	70
28 "	Lock	3	600

Mounting:—Starter is flange mounted at the left of the engine on the forward side of the flywheel housing. To remove starter, disconnect cable and starting switch pedal linkage and take out three flange mounting cap screws. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the starter armature shaft every six weeks or each 2500 miles of operation. Every six months remove the plug in the reduction gear case and repack gears with graphite grease.

GENERATOR:—**Model 927-J.** The direction of rotation is counter-clockwise,

viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance connected across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the round headed lock screw on the commutator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the lock screw after making the adjustment. With standard car setting the maximum charging rate is 19.5 amperes (cold) reached at 1600 R.P.M. or 22-25 miles per hour.

Generator Data					
Cold Test		R.P.M.	Hot Test		R.P.M.
Amperes	Volts		Amperes	Volts	
20-22	8.5-8.7	1600	12-14	7.6-7.9	1800

Shunt field current is 1.8-2.3 amperes at 6 volts. Brush spring tension is 20-28 ounces. Generator draws 3.5 amperes at 6 volts operating as a motor.

Mounting:—Generator is cradle mounted at the left of the engine and is driven by the fan belt. The water pump is driven by an extension of the generator shaft. To remove generator, disconnect water pump drive coupling and relay lead and loosen mounting clamp band. Slip off drive belt and lift generator from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every six weeks or each 2500 miles of operation.

RELAY:—**Model 265-B.** Relay is mounted on the generator field frame. Relay contacts close at 7-10 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 1-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .015-.025 inch. Air gap is .014-.020 inch with contacts closed.

LIGHTING:—**Clum Lighting Switch Model 9115.** Lighting switch is mounted at the lower end of the steering column. Double filament headlight bulbs are standard equipment. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights (for parking) are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash, tail and instrument lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome and corner lights are each 6-8 volt, 6 cp. S.C. Mazda 81.

CURRENT LIMIT RELAY:—**Model 410-F.** This device is a vibrating circuit breaker connected in the lighting circuits to protect them from overload and short circuits. Circuit breaker begins to vibrate when the current reaches 30-35 amperes and continues limiting the current to 5-18 amperes. Circuit breaker contact gap is .012-.030 inch. Air gap is .015-.025 inch. Plunger spring tension is 5 ounces minimum.

STUTZ

MODEL LA-127 1/2" WHEELBASE (1931)

DELCO-REMY GENERATING, STARTING SYSTEM DELCO-REMY IGNITION

BATTERY:—Prest-O-Lite, Type A-617-SH. 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 170 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 32 hours. Battery is mounted under the left front seat.

IGNITION:—Coil Model 528-C (two used). Coils are mounted under the hood on the right side. Ignition current is 10 amperes at 6 volts with engine stopped and 6 amperes at 6 volts with engine running. The ignition switch is a Delco-Remy Dual-lock Model 426-K.

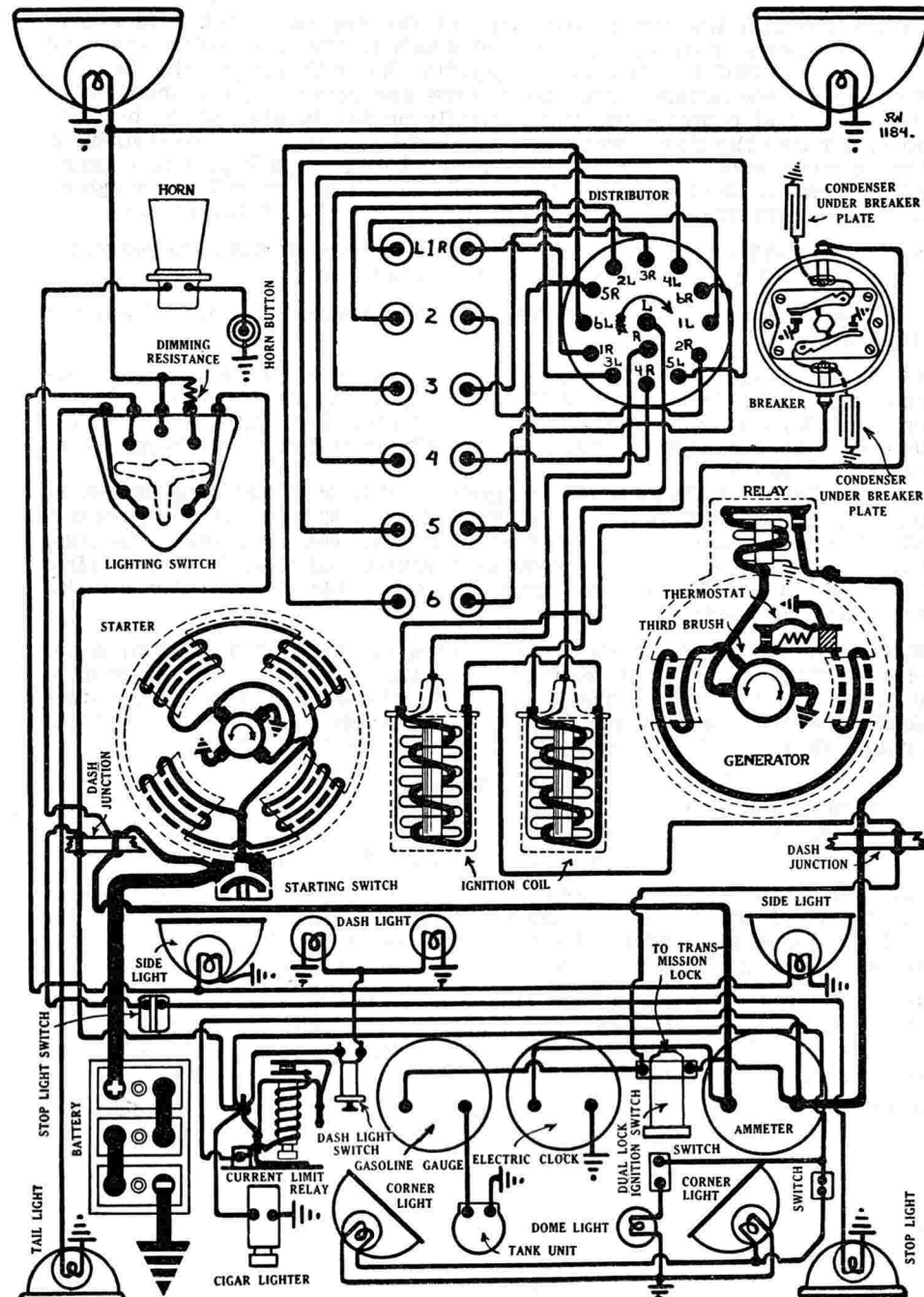
Distributor Model 4043. Breaker contacts separate .017 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until correct gap is obtained with breaker arm on lobe of cam. Re-surface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 17-21 ounces. Distributor is semi-automatic. Maximum manual advance is 38 degrees (engine). Automatic advance begins at 400 R.P.M. (engine). Maximum automatic advance is 22 degrees reached at 2600 R.P.M. There are two sets of contacts on a six sided cam. Contacts open simultaneously and each set of contacts controls one coil and fires one set of spark plugs. The electrical circuit of each coil is entirely separate except that one distributor is used. Contacts must be synchronized for correct performance. See Timing.

Mounting:—Distributor is mounted on accessory bracket at right of engine. To remove distributor, disconnect manual advance rod and primary leads and remove distributor head with cables intact. Then remove manual advance stop screw and lift distributor from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the side of the distributor every 750 miles. Every 1000 miles remove the distributor head and rotor and put a small amount of vaseline on the face of the breaker cam and oil the breaker arm pivot pins with light engine oil.

Timing:—**Synchronization of Contacts.** Contacts must be synchronized so that they open at the same instant firing both spark plugs in each cylinder simultaneously. Connect a six volt lamp in each primary circuit. Turn ignition on and crank engine over slowly. The lamps will go out as each set of contacts open. If both lamps go out at the same instant the contacts are synchronized. If they do not, loosen the four lock screws on the breaker plate and shift the plate causing one set of contacts to open earlier or later until synchronization is effected. Then tighten lock screws and check contact gap with breaker arm on lobe of cam. If outside limits of .015-.020 inch, reset at .017 inch and repeat synchronization.

Timing Distributor to Engine. Breaker contacts begin to open when the piston entering power stroke reaches a position 15 degrees before top dead center with the spark lever in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully retard spark lever and continue to crank engine until piston reaches top dead center when the flywheel mark 'Top C 1 & 6' will be in the center of the inspection hole in the upper flywheel case. Then advance spark lever exactly 6/10 of the total range with the ignition turned on. At this point the ammeter should drop from an indicated discharge of 10 amperes to '0'. If it drops in two stages of 5 amperes each it indicates that the contacts are not synchronized. If the ammeter reading does not drop at this point, loosen the lock screw in the center of the breaker cam and carefully rotate cam until contacts open. Tighten the lock screw and connect the segment opposite the rotor segment connected to the terminal in the center of the distributor head to right hand spark



STUTZ

MODEL LA-127½" WHEELBASE (1931)

DELCO-REMY GENERATING, STARTING SYSTEM

DELCO-REMY IGNITION

plug in cylinder No. 1. Connect the remaining spark plugs as shown on the diagram.

Firing Order:—The firing order is 1-5-3-6-2-4. Spark plugs are connected 1R-6L-5R-2L-3R-4L-6R-1L-2R-5L-4R-3L clockwise around the distributor head. Spark plugs are right (R) and left (L) in the cylinder head as viewed from the driver's seat and No. 1 cylinder is nearest the radiator.

Spark Plugs:—Spark plugs are 18 MM. Metric Standard. Gaps are .022 inch.

VALVE TIMING:—Specifications. Head diameter, 1 21/32 inches. Stem diameter, 3/8 inch. Stem length, 6 11/32 inches (top of seat to end of stem). Valve lift, 11/32 inch. Spring pressure, 102 pounds with valve open (spring length, 2 5/64 inches) and 56 pounds with valve closed (spring length, 2 27/64 inches. Tappet clearance or lash between valve cap and cam, .028 inch. Valve stem guides are removable. Oversize valves are not made.

Valve Timing. Inlet valves open 7 degrees after top dead center and close 47 degrees after lower dead center. Exhaust valves open 49 degrees before lower dead center and close 7 degrees after top dead center.

To Set Valve Timing. Cam shaft sprocket should be taken off cam shaft and automatic adjusting sprocket must be off engine. Crank engine over until piston No. 1 reaches a position 7 degrees past top dead center when the flywheel mark 'EX.CL.1&6 IN.OP.1&6' will be in the exact center of the inspection hole in the upper flywheel housing. Then turn cam shaft until the heel of the first cam at the front of the engine is directly above No. 1 valve (exhaust valve in cylinder No. 1). Set lash or clearance between valve cap and cam at .028 inch (this is very important). Then turn cam shaft in direction of rotation (clockwise) until the valve has opened and just closed. This may be determined by inserting pin in hole in valve cap and oscillating valve. The added drag when the valve seats will be perceptible. Then mesh cam shaft sprocket in upper chain and rotate sprocket counter-clockwise to take up all the slack in the driving side of the chain. Line up holes in sprocket and cam shaft flange by slipping chain one tooth at a time on the transfer sprocket. Insert four cap screws mounting sprocket on cam shaft. Mesh automatic adjusting sprocket in chain and insert eccentric adjusting hub. Wind up spiral spring one and one half turns to provide proper chain tension and insert spring tongue in nearest slot. Assemble plain washer on sprocket shaft and insert cotter.

STARTER:—Model 726-C. Starter is connected to the engine through a clutch and manual pinion shift connected to the starting switch. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 24-28 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	6000	5	65
15 "	Lock	3.15	570

Mounting:—Starter is flange mounted at left of engine on forward side of

flywheel housing. To remove starter, disconnect cable and starting pedal linkage and remove three flange mounting cap screws. Then pull starter forward and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler on the commutator end of the starter every 750 miles. The drive end bearing is oilless.

GENERATOR:—Model 391. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field and thermostat. Thermostat contacts open at 165°F. cutting the resistance across the thermostat contacts in series with the shunt field and reducing the output approximately 40%. To adjust generator output, remove the commutator cover band and loosen the small round headed screw on the generator end plate. Then shift the third brush by hand in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. Tighten the screw after making the adjustment. With standard car setting, the maximum charging rate is 12 amperes (hot) at 7.6 volts reached at 2000 R.P.M. or 32 M.P.H.

Generator Data					
Cold Test			Hot Test		
Amperes	Volts	R.P.M.	Amperes	Volts	R.P.M.
22-24	8.2-8.62	1400	10-12	7.35-7.65	1600

Shunt field current is 1.8-2.3 amperes at 6 volts. Brush spring tension is 20-28 ounces.

Mounting:—Generator is flange mounted at right of engine on rear of accessory bracket. To remove generator, disconnect water pump drive coupling and generator lead and remove three flange mounting cap screws. Then pull generator to rear and lift from place.

Oiling:—Put 8 or 10 drops of light engine oil in the oiler at each end of the generator every 750 miles.

RELAY:—Model 265-B. Relay is mounted on the generator. Relay contacts close at 575 R.P.M. or 8 M.P.H. when the generator voltage reaches 7-7.5 volts and open with a discharge current of 0-2.5 amperes. Contacts separate .015-.020 inch. Air gap is .014-.021 inch with contacts closed.

LIGHTING:—Delco-Remy Switch Model 486-G. Lighting switch is mounted at lower end of steering column. Headlights are dimmed by resistance on switch. Headlights are 6-8 volt, 32 cp. S.C. Mazda 1133. Cowl lights are 6-8 volt, 3 cp. S.C. Mazda 63. Stop light is 6-8 volt, 15 cp. S.C. Mazda 87. Dash and tail lights are each 6-8 volt, 3 cp. S.C. Mazda 63.

CURRENT LIMIT RELAY:—Model 410-C. This device is a vibrating circuit breaker mounted on the dash and connected in the lighting circuits. It begins to vibrate when the current flow reaches 20-30 amperes and continues limiting the current to 2-15 amperes. Contacts separate .012-.030 inch. Air gap is .019-.025 inch with contacts closed.

WHIPPET

MODEL 96-A (1930-31)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—U.S.L., Type 3-CVX-5X-6A, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 98 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 17 hours. Battery is mounted on left frame member.

IGNITION:—Coil Model IG-4083. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes with engine stopped.

Distributor Model IGB-4042-A. Breaker contacts separate .018-.020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until correct gap is secured with breaker arm on lobe of cam. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 20 degrees (engine). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 22 degrees reached at 3400 R.P.M. of the engine.

Mounting:—Distributor is mounted on the rear of the generator at the right of the engine. To remove distributor, disconnect manual spark control and primary lead and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Put 5 to 8 drops of light engine oil in the oiler on the side of the distributor every two weeks or each 500 miles. Every 5000 miles put one drop of oil on the breaker arm pivot pin and put a small bit of vaseline on the face of the breaker cam.

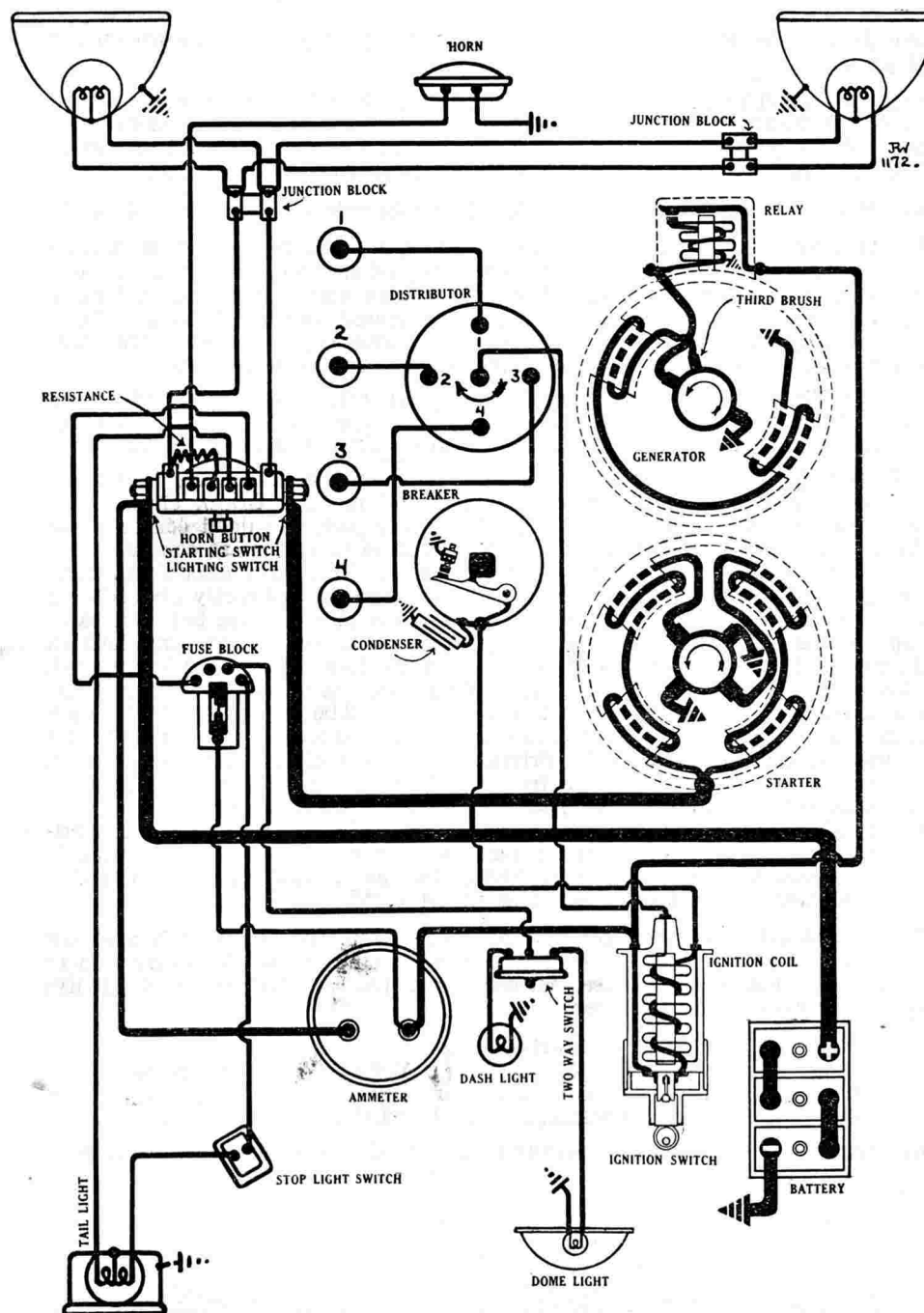
Timing:—Breaker contacts begin to separate when the piston entering power stroke reaches top dead center with the manual spark control in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance spark control and continue to crank engine until the top dead center mark on the flywheel is opposite the indicator mark in the flywheel case. Loosen advance arm clamp screw and rotate distributor until the contacts begin to open. Tighten the clamp screw and connect the segment opposite the rotor to the spark plug in cylinder No. 1. Connect the remaining spark plugs in order 3-4-2 clockwise around the distributor head.

Firing Order:—The firing order is 1-3-4-2.

Spark Plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Standard. Champion No. 4 Special. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, $1 \frac{17}{32}$ inches. Stem diameter, $11 \frac{1}{32}$ inch. Stem length, $5 \frac{1}{2}$ inches. Valve lift, $\frac{5}{16}$ inch. Spring pressure, 75 pounds (spring length, 2 inches). Tappet clearance, .004 inch. Inlet valves open 7 degrees after top dead center and close 39 degrees after lower dead center.

EXHAUST VALVES. Head diameter, $1 \frac{7}{16}$ inches. Stem diameter, $11 \frac{1}{32}$ inch. Stem length, $5 \frac{1}{2}$ inches. Valve lift, $\frac{5}{16}$ inch. Spring pressure, 75 pounds (spring length, 2 inches). Tappet clearance, .006 inch. Exhaust valves open 38 degrees before lower dead center and close 2 degrees before top dead center. Valve stem guides are removable. Valves with oversize stems are not made.



WHIPPET

MODEL 96-A (1930-31)

AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

STARTER:—Model MZ-4018. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 2½-3 pounds. Starter cranks the engine at 130 R.P.M.

Starter Data			
Torque	R.P.M.	Volts	Amperes
0 lb. ft.	Free	6	50
1.5 "	1800	5.2	150
2.5 "	1325	5.0	200
5.0 "	740	4.5	300
7.6 "	220	4.0	400
12.2 "	Lock	4.0	550

Mounting:—Starter is flange mounted at right of engine on forward side of rear motor support. To remove starter, disconnect cable and remove three flange mounting cap screws. Then pull starter forward to clear Bendix drive and lift from place.

Oiling:—Starter bearings are oilless. They require no attention.

GENERATOR:—Model GAL-4116. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by tapping on the brush mounting stud with a screw driver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush is held in position by friction between the mounting stud and the end plate. With standard car setting the maximum charging rate is 17 amperes at 8 volts reached at 2075 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	675
6	6.9	835
10	7.3	1025
14	7.65	1275
17.2	8.0	2075
14	7.65	2925

Brush spring tension is 24-32 ounces. Motoring, generator draws 4.7-5.7 amperes at 6 volts. Shunt field current is 4.2 amperes at 6 volts.

Mounting:—Generator is mounted at right of engine on rear of timing chain case. To remove generator, disconnect all ignition wiring or remove distributor. Then take off cover plate over chain case, remove nut on generator sprocket, pull sprocket. Then remove clamp band on generator, pull generator to the rear and lift from place. Tie up the timing chain and do not attempt to crank the engine with the generator out.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles.

RELAY:—Model CB-4014. Relay is mounted on generator. Relay closes at 675 R.P.M. when the voltage of the generator reaches 7-7.5 volts and opens with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contacts separate .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Aid Type 805. Lighting switch is of 'Finger Tip Control' type and is mounted at the lower end of the steering column. The lighting switch, starting switch and horn button are combined in one unit controlled by a button on the steering wheel. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. A parking resistance mounted on the switch dims the upper filament of the headlights for use as a parking light. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Dash and dome lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail lamp lead must be connected to the 3 cp. filament.

FUSES:—Lighting fuse mounted on fuse block on the dash is 20 ampere capacity.

WILLYS SIX

MODELS 97 AND 98-D (1931) SERIAL NUMBERS 1001 UP
PRODUCTION STARTED NOVEMBER 1930
AUTO-LITE GENERATING, STARTING SYSTEM
AUTO-LITE IGNITION

BATTERY:—U.S.L., Type XY-13X-7A, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 102 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 17.6 hours. Battery is mounted under the front compartment floor boards on the left side.

IGNITION:—Coil Model IG-4303. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-1.5 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

Distributor Model IGB-4032. Breaker contacts separate .018-.020 inch. Set contact gap by loosening stationary contact mounting stud and turning up stud until gap is .018 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 10 degrees (distributor). Automatic advance begins at 400 R.P.M. of engine. Maximum automatic advance is 10 degrees (distributor) reached at 3000 R.P.M. of engine.

Mounting:—Distributor is mounted at left of engine and is driven by an inclined shaft from the camshaft. To remove distributor, disconnect primary lead and manual spark control and remove distributor cap with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

Oiling:—Put 5 to 8 drops of light engine oil in the oiler on the side of the distributor every week or each 250 miles of operation. Every 500 miles remove the distributor cap and rotor and put 2 or 3 drops of oil in the oiler in the center of the shaft. Every 5000 miles coat the breaker cam with a light film of vaseline.

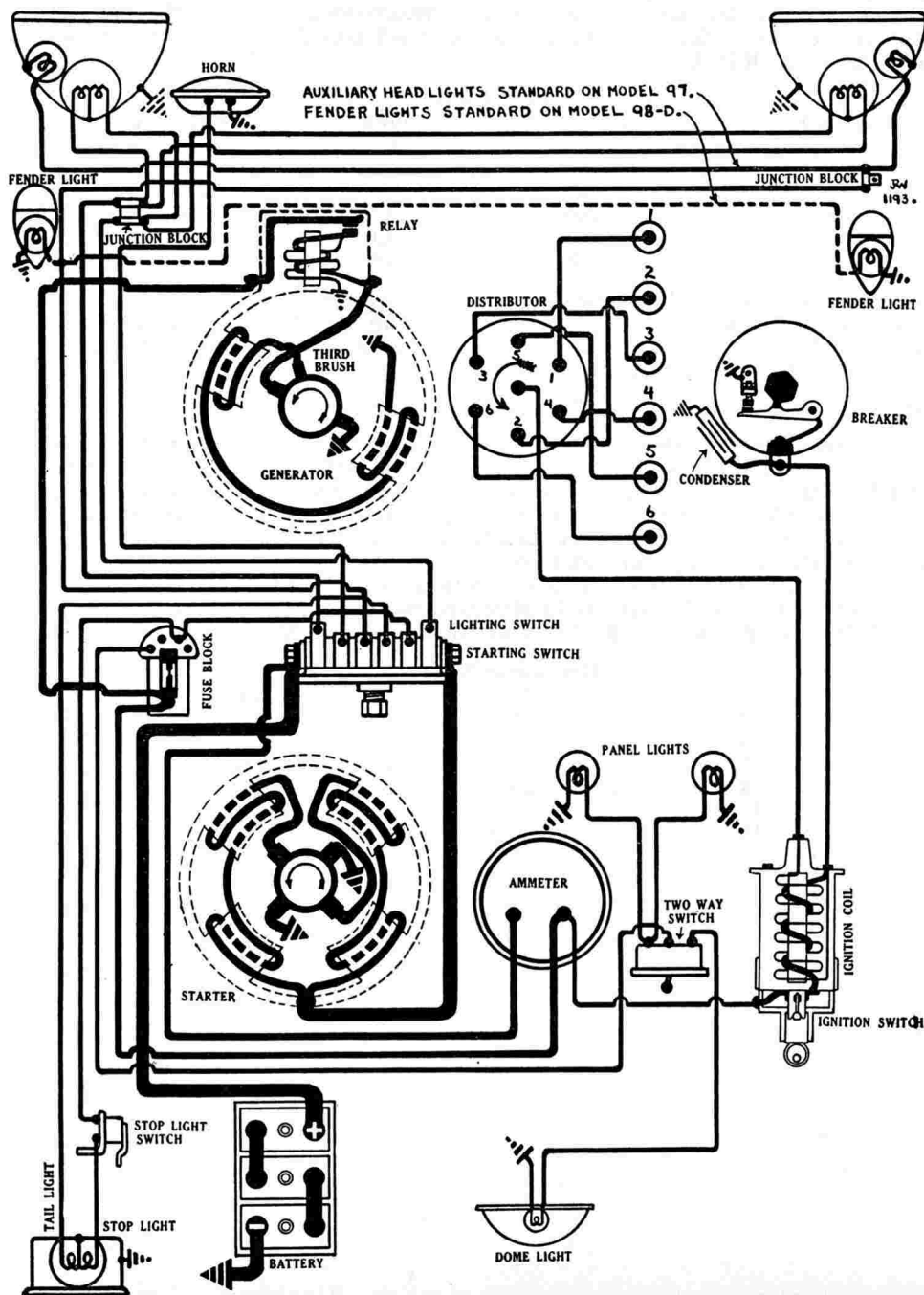
Timing:—Breaker contacts begin to open when the piston entering power stroke reaches top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). Fully advance spark control by pushing spark control button all the way in toward the dash and see that distributor is turned clockwise as far as possible. Remove cover over inspection hole in left front face of flywheel housing. Turn engine over until piston reaches top dead center when the flywheel mark 'IGN/CYL. 1-6' will be directly opposite the indicator mark on the housing. Then loosen advance arm clamp screw and turn distributor until contacts begin to open. Tighten the clamp screw and see that the spark plugs are wired in accordance with the firing order shown on the diagram.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 18 MM. Metric. Champion Type C-7. Gaps are .025 inch.

VALVE TIMING:—INLET VALVES. Head diameter, 1 5/8 inches. Stem diameter, 3/8 inch. Valve lift, 5/16 inch. Spring pressure, 97-102 pounds (spring length, 1 15/16 inches). Tappet clearance, .004 inch (hot). Inlet valves open 7 degrees before top dead center and close 39 degrees after lower dead center.

EXHAUST VALVES. Head diameter, 1 15/32 inches. Stem diameter, 3/8 inch. Valve lift, 5/16 inch. Spring pressure, 97-102 pounds (spring length, 1 15/16 inches). Tappet clearance, .006 inch (hot). Exhaust valves open 49



WILLYS SIX

MODELS 97 AND 98-D (1931) SERIAL NUMBERS 1001 UP

PRODUCTION STARTED NOVEMBER 1930

AUTO-LITE GENERATING, STARTING SYSTEM

AUTO-LITE IGNITION

degrees before lower dead center and close 2 degrees before top dead center. The flywheel is marked 'I.O./' for inlet opening and 'E.C./' for exhaust closing of cylinder No. 1. Valve stem guides are removable. Valves with over-size stems are not made.

STARTER:—Model MZ-4024. Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 44-56 ounces. The starting switch is mounted on the lower end of the steering column and is operated by pulling up on the button on the steering wheel.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.65 lb. ft.	2500	5.5	100
2.55 "	1325	5.0	200
4.95 "	750	4.5	300
7.65 "	220	4.0	400
12.2 "	Lock	4.0	550

Mounting:—Starter is flange mounted at left of engine on forward face of flywheel housing. To remove starter, disconnect cable and take out three flange mounting bolts. Then pull starter forward to clear drive and lift from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the starter each 500 miles of operation.

GENERATOR:—Model GAL-4131. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The third brush is held in position by friction between the brush mounting stud and the end plate. With standard car setting the maximum charging rate is 18 amperes at 8 volts reached at 1900 R.P.M. (cold).

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	675
6	6.9	835
10	7.3	1025
14	7.65	1275
18	8.0	1900
14	7.65	2925

Brush spring tension is 24-32 ounces. Shunt field current is 4.2 amperes at 6 volts. Generator, motoring, draws 4.7-5.7 amperes at 6 volts.

Mounting:—Generator is mounted at left of engine on a special swinging bracket and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then take out mounting bolt in swing bracket and lift generator from place.

Belt Adjustment. Fan belt tension is adjusted by shifting the generator. To take up fan belt, loosen adjustment clamp bolt and mounting bolt and swing generator to the left or away from the engine until the proper belt tension is secured. Tighten the mounting bolts. The belt should be just tight enough to drive the generator and fan without slipping.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every week or each 250 miles of operation. Every 1000 miles fill the grease cup under the bearing retainer on the commutator end of the generator with pure vaseline.

RELAY:—Model CB-4014. Relay is mounted on the generator field frame. Relay contacts close at 675 R.P.M. when the generator voltage reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Finger Tip Control Switch Model A-805. Switch is mounted at the lower end of the steering column and is controlled by a button on the steering wheel. The starting switch, lighting switch and horn button are incorporated in a single unit. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Parking lights in headlights (on Model 97) and side lights (on Model 98) are each 6-8 volt, 3 cp. S.C. Mazda 63. Dash light and dome light are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop light and tail light are 6-8 volt, 21-2 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 2 cp. filament.

FUSES:—Lighting fuse mounted on fuse block on lower left front side of dash is 20 ampere capacity.

WILLYS EIGHT

MODEL 8-80 (1930) SERIAL NUMBERS 1001 UP MODEL 8-80D (1931) SERIAL NUMBERS 1001 UP AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

BATTERY:—U.S.L., Type 3-HVX-7X-6A, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 148.4 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 28 hours. Battery is mounted under the left front floor boards.

IGNITION:—Coil Model IG-4083 (1930), IG-4303 (1931). The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-1½ amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

NOTE:—The model IG-4303 coil used on 1931 models has both the ammeter lead terminal and gas gauge terminal at the switch end of the coil. The breaker lead terminal only at the high tension end of the coil is used.

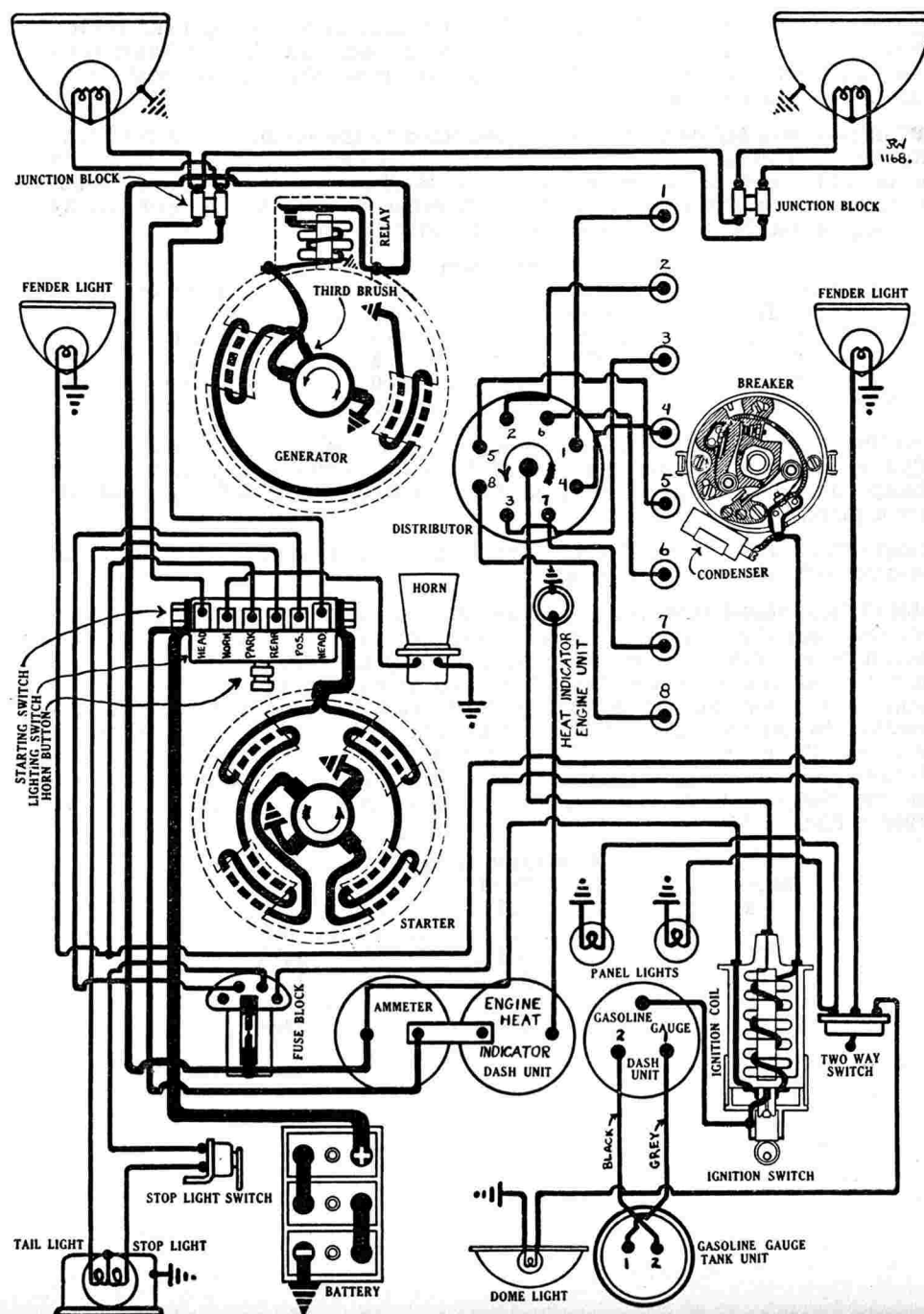
Distributor Model IGH-4013. Breaker contacts separate .018-.020 inch. Set contact gap by loosening two lock screws on stationary contact mounting plate and turning eccentric adjusting screw (first set mounted on breaker plate). The second set mounted on the movable sub-plate are adjusted by loosening the lock nut on the stationary contact mounting stud and turning up the stud. Resurface contacts with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-21 ounces. Distributor is semi-automatic. Maximum manual advance is 10 degrees (distributor). Automatic advance begins at 600 R.P.M. of engine. Maximum automatic advance is 11 degrees (distributor) reached at 3400 R.P.M. of engine. Breaker has two sets of contacts operating on a four sided cam. Contacts open alternately at intervals of 45 degrees corresponding to the 90 degree firing interval of the engine. Contacts must be synchronized for satisfactory performance. See Timing.

Mounting:—Distributor is mounted at left of engine and is driven by an inclined shaft. The oil pump is mounted at the right of the engine on the other end of the shaft. To remove distributor, disconnect primary lead and spark control wire and remove distributor head with cables intact. Then take out the mounting screw in the advance arm and lift the distributor from place.

Oiling:—Fill the oiler on the side of the distributor with light engine oil every 250 miles or each week of operation. Every 500 miles remove the distributor head and rotor and put 3 or 4 drops of oil in the oiler in the center of the shaft. Every 5000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—**Synchronization of Contacts.** Synchronize contacts on a rotary spark gap or use special Auto-Lite Test Indicator and follow complete directions in Equipment Section. Synchronization should be checked whenever contacts are resurfaced or when ignition timing is checked. This is important since timing of four cylinders will be thrown off if contacts are allowed to get out of synchronization.

Timing Distributor to Engine:—Breaker contacts begin to separate when the piston entering power stroke reaches a position .0136 inch before dead center (or 6 degrees on the flywheel), with the spark control button in the fully advanced position. To set timing, crank engine over until piston No. 1 enters compression stroke (the up stroke with both valves closed). See that manual spark control button is fully advanced (pushed all the way in toward the dash). Remove cover over timing inspection hole in front face of flywheel housing at left of engine and turn engine over until the flywheel mark 'IGN' is directly opposite the pointer on the housing. This mark is 6 degrees before the top dead center mark for piston No. 1 '1&8/T.C.' Then



WILLYS EIGHT

MODEL 8-80 (1930) SERIAL NUMBERS 1001 UP MODEL 8-80D (1931) SERIAL NUMBERS 1001 UP AUTO-LITE GENERATING, STARTING SYSTEM AUTO-LITE IGNITION

loosen advance arm clamp screw and rotate distributor until one set of contacts begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment connected to the spark plug in cylinder No. 1.

Firing Order:—The firing order is 1-6-2-5-8-3-7-4.

Spark Plugs:—Spark plugs are 18 MM. Metric Champion No. 8. Gaps are .025 inch.

VALVE TIMING:—**INLET VALVES.** Head diameter, 1 17/32 inches. Stem diameter, 3/8 inch. Valve lift, 21/64 inch. Spring pressure, 92-100 pounds (compressed to 1 15/16 inches). Tappet clearance, .006 inch (hot). Inlet valves open at top dead center and close 38 degrees after lower dead center. The flywheel is marked '1&8T.C./I.O.' at point of inlet opening for cylinder No. 1.

EXHAUST VALVES. Head diameter, 1 15/32 inches. Stem diameter, 3/8 inch. Valve lift, 21/64 inch. Spring pressure, 92-100 pounds (compressed to 1 15/16 inches). Tappet clearance, .008 inch (hot). Exhaust valves open 34 degrees before lower dead center and close 4 degrees after top dead center. Valve stem guides are removable. Valves with oversize stems are not made.

STARTER:—**Model MAB-4031 (1930), MAB-4035 (1931).** Starter is connected to the engine through a Bendix drive. The direction of rotation is counter-clockwise, viewed from the commutator end. Brush spring tension is 28-36 ounces. The starter switch is mounted at the lower end of the steering column and is controlled by a button on the steering wheel.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.	1910	5.5	100
3.5 "	1100	5.0	200
6.6 "	625	4.5	300
10.2 "	420	4.0	400
24.0 "	Lock	4.0	725

Mounting:—Starter is flange mounted at left of engine on forward side of flywheel housing. To remove starter, disconnect cable and take out three flange mounting bolts. Then pull starter forward and lift from place.

Oiling:—Put 4 to 6 drops of light engine oil in the oiler at each end of the starter every two weeks or each 500 miles of operation.

GENERATOR:—**Model GAL-4131.** The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the charging rate. The third brush is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 18 amperes at 8 volts reached at 1900 R.P.M.

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	675
6	6.9	835
10	7.3	1025
14	7.65	1275
18	8.0	1900
14	7.65	2925

Shunt field current is 4.2 amperes at 6 volts. Generator, motoring, draws 4.7-5.7 amperes at 6 volts. Brush spring tension is 24-32 ounces. No field fuse is used.

Mounting:—Generator is mounted on special swinging bracket at left of the engine and is driven by the fan belt. To remove generator, disconnect lead and loosen adjustment clamp bolt. Swing generator toward engine and slip off drive belt. Then take out bolts in mounting lugs under generator and lift generator from place.

Belt Adjustment. To adjust belt tension, loosen adjustment clamp bolt and mounting bolts. Swing generator away from engine until correct belt tension is secured and tighten bolts. The belt should be just tight enough to drive the generator and fan shaft without slipping. Excessive belt tension will cause generator bearing wear.

Oiling:—Put 4 to 6 drops of light engine oil in the oiler at each end of the generator every 250 miles of operation. Every 1000 miles remove the grease cup directly under the bearing retainer on the commutator end of the generator and refill with pure vaseline. This is important.

RELAY:—**Model CB-4014.** Relay is mounted on the generator. Relay contacts close at 675 R.P.M. of the generator armature when the generator voltage reaches 7-7.5 volts and open with a discharge current of 2.5 amperes. Charging current at closing of contacts is 2 amperes. Relay contact gap is .035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—**Pines 'Finger Tip Control' Switch.** Switch is mounted at lower end of steering column. The starting switch, lighting switch and horn button are combined in one unit controlled by a button on the steering wheel. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. This is a double filament bulb with two 21 cp. filaments. Side and dash lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Dome light is 6-8 volt, 3 cp. S.C. Mazda 63. Tail and stop light is 6-8 volt, 3-21 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament.

Switch:—Lighting switch is No. 803.

FUSES:—Lighting fuse mounted on fuse block on left front side of dash is 20 ampere capacity.

WILLYS KNIGHT

MODEL 87 SERIAL NUMBERS 1001 UP

PRODUCTION STARTED APRIL 1, 1930

AUTO-LITE GENERATING, STARTING SYSTEM

AUTO-LITE IGNITION

BATTERY:—U.S.L., Type 3-HVX-6X-6A, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 127 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 23 hours. Battery is mounted on the left frame member under the floor boards of the front compartment.

IGNITION:—Coil Model IG-4083. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the ignition switch extending through to the face of the instrument panel. Ignition current is 1-3 amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

Distributor Model IGC-4045. Breake contacts separate .018-.020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until correct gap is secured with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 16-20 ounces. Distributor is semi-automatic. Maximum manual advance is 10 degrees (distributor). Automatic advance begins at 800 R.P.M. of engine. Maximum automatic advance is 10 degrees reached at 2350 R.P.M. of engine.

Mounting:—Distributor is mounted on accessory drive housing at right of the engine. To remove distributor, disconnect primary lead and spark control wire and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

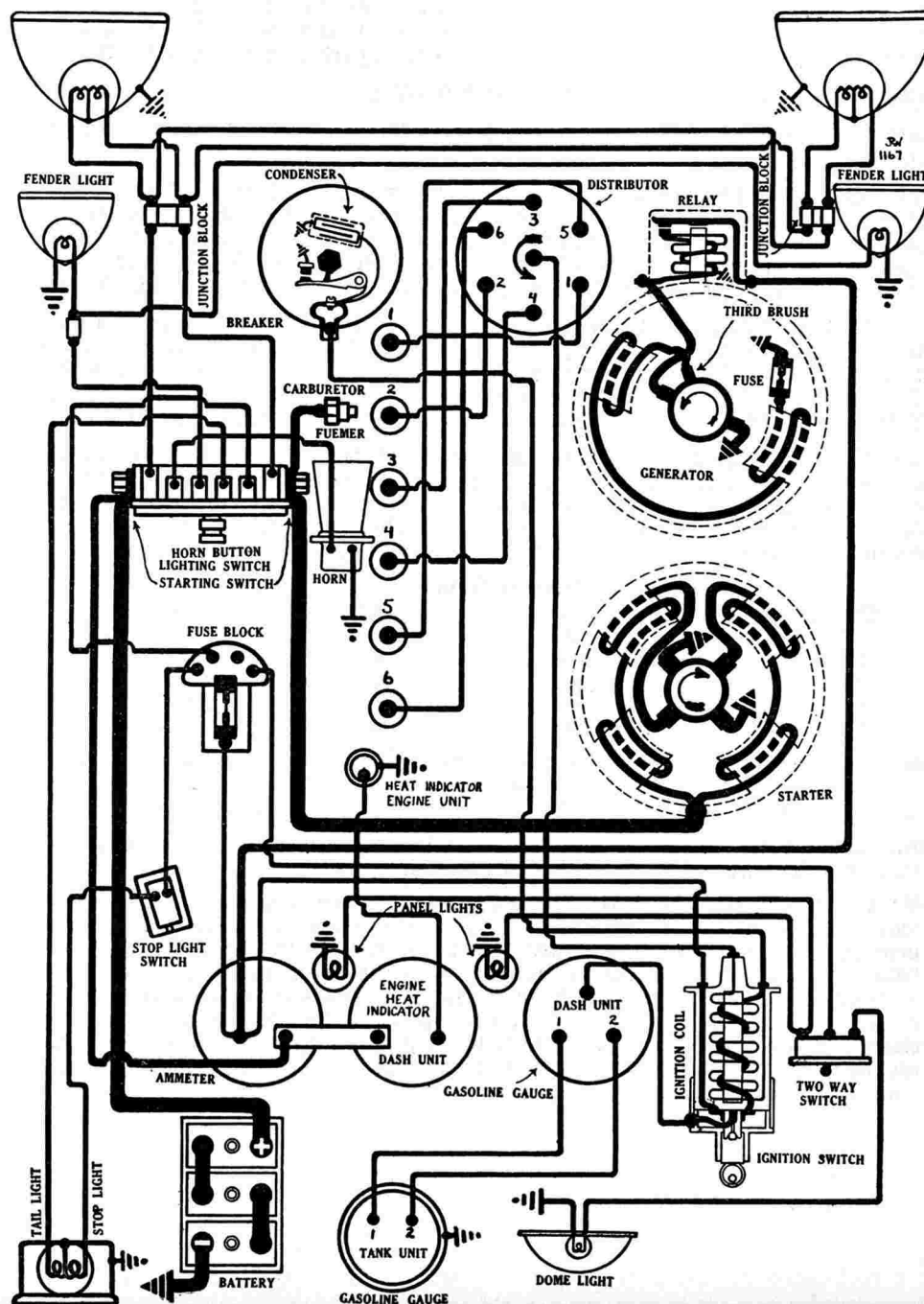
Oiling:—Fill the oiler on the side of the distributor with light engine oil every week or each 250 miles. Every 500 miles remove the distributor head and rotor and oil the wick oiler in the center of the shaft and put one drop of oil on the breaker arm pivot pin. Every 5000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position 8 degrees before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke. This may be determined by removing the spark plug in cylinder No. 1 and turning engine over until the air compressed in the cylinder is felt escaping when the plug port is closed by hand. Place spark control button in the fully advanced position and turn engine over until the ignition mark on the flywheel 'IGN/' is directly opposite the indicator in the clutch inspection hole. The flywheel mark is 8 degrees before the top dead center mark 'T/C'. Then loosen advance arm clamp screw and rotate distributor until the breaker contacts begin to open. Tighten the clamp screw and see that the rotor is directly opposite the segment connected to the spark plug in cylinder No. 1 (see diagram).

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark plugs:—Spark plugs are $\frac{7}{8}$ -18 S.A.E. Std. Champion No. 1. Gaps are .025 inch.

VALVE TIMING:—The Willlys Knight engine is of the Sleeve Valve type. To time the sleeve valves after dismantling and removing the timing chain cover, remove the idler eccentric collar and sprocket after which the timing chain can be removed. Remove the pipe plug in the exhaust manifold opposite No. 6 cylinder and scrape the carbon from the edges of the sleeve port so that the closing of the port can be checked. Then remove the clutch inspection plate and crank engine over until flywheel mark 'EC' is opposite



WILLYS KNIGHT

MODEL 87 SERIAL NUMBERS 1001 UP

PRODUCTION STARTED APRIL 1, 1930

AUTO-LITE GENERATING, STARTING SYSTEM

AUTO-LITE IGNITION

the top dead center on the flywheel case. Make sure the mark on the end of the eccentric shaft and the mark on the eccentric shaft sprocket coincide. Then remove spark plug in cylinder No. 6 and place a test lamp over the spark plug port so that the light is visible through the exhaust port. Then turn the eccentric shaft in a clockwise direction until the port closes when the rays from the light will be cut off. Assemble the chain on the crankshaft, idler and generator sprockets. Insert the eccentric shaft sprocket in the chain and set the tension of the timing chain by turning the idler eccentric bushing spring until all slackness is removed from the chain and then turning one additional turn before inserting end in slot of idler stud. With motor set in this position the distributor arm should be under the contact for No. 1 cylinder. The motor can be timed from the front end by bringing the crankshaft on top dead center for Nos. 1 and 6 cylinders. Then set the mark on the eccentric shaft and the mark on the eccentric shaft sprocket in line with the mark on the crankcase. In this position the distributor arm should be under No. 1 cylinder.

Valve specifications. Inlet opens at top dead center and closes 46 degrees or 4 19/32 inches on the flywheel after lower dead center with the piston 3.842 inches from the top of the intake stroke. Exhaust ports open 50 degrees or 5 inches on the flywheel before lower dead center with the piston 3.726 inches down on the power stroke and close 5 degrees or one-half inch on the flywheel before top dead center with the piston .010 inch before top dead center.

STARTER:—Model MAB-4014. Starter is connected to the engine through a Bendix drive. The direction of rotation is clockwise, viewed from the commutator end. Starter cranks the engine at 140 R.P.M. drawing 250 amperes at 6 volts. Brush spring tension is 21-36 ounces.

Starter Data			
Torque	R.P.M.	Volts	Amperes
.6 lb. ft.	1900		100
3.5 "	1100		200
6.6 "	700		300
10.2 "	400		400
24.0 "	Lock		500

Mounting:—Starter is sleeve mounted at the right of the transmission at the rear of the flywheel housing. To remove starter, take up front floor boards and disconnect cable. Then take out large pilot mounting screw in housing directly above starter sleeve. Pull starter to rear to clear Bendix drive and lift from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the starter every two weeks or each 500 miles of operation.

GENERATOR:—Model GAL-4103. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third

brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise direction to increase the charging rate and in the opposite direction to decrease the output. The third brush and mounting plate are held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 12 amperes (hot) at 8 volts reached at 2075 R.P.M. or 23 M.P.H.

Generator Data		
Amperes	Volts	R.P.M.
2	6.4	675
6	6.9	835
10	7.3	1025
14	7.65	1275
17.2	8.0	2075
14	7.65	2925

Brush spring tension is 24-32 ounces. Generator field fuse is 5 ampere capacity. Generator, motoring, draws 4.7-5.7 amperes at 6 volts. Shunt field current is 4.2 amperes at 6 volts.

Mounting:—Generator is cradle mounted at right of engine and is driven from the chain case. To remove generator, disconnect lead and loosen mounting clamp band. Then disengage coupling and lift generator from place.

Oiling:—Put 4 or 5 drops of light engine oil in the generator oilers every week or each 250 miles. Every 1000 miles fill the grease cup under the bearing retainer on the commutator end of the generator with pure vaseline.

RELAY:—Model CB-4014. Relay is mounted on the generator. Relay closes at 5.5-6 M.P.H. or 750 R.P.M. when the generator voltage reaches 7-7.5 volts and opens with a discharge current of 0-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .020-.030 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Pines 'Finger Tip Control' Switch. Model A-805. Lighting switch, starting switch and horn button are combined in a single unit mounted at the lower end of the steering column and controlled by a button on the steering wheel. Headlights are equipped with double filament bulbs using a second 21 cp. filament instead of dimmers. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash and dome lights are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail light is 6-8 volt, 21-3 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 3 cp. filament.

FUSES:—Generator field fuse is 5 ampere capacity. Lighting fuse mounted on fuse block on left front of dash is 20 ampere capacity.

**MODEL 66-D (1931) SERIAL NUMBERS 1001 UP
PRODUCTION STARTED DECEMBER 1930
AUTO-LITE GENERATING, STARTING SYSTEM
AUTO-LITE IGNITION**

BATTERY:—U.S.L., Type 3-HVX-8X-6A, 6 volt. The negative (—) terminal is grounded. Starting capacity (20 minute rate) is 169.6 amperes for 20 minutes. Lighting capacity (5 ampere rate) is 5 amperes for 33.2 hours. Battery is mounted under the front compartment floor boards at the left of the car.

IGNITION:—Coil Model IG-4303. The ignition switch is built in the base of the coil. Coil is mounted on the back of the instrument board with the switch extending through to the face of the instrument panel. Ignition current is 1-1½ amperes at 6 volts with engine running and 3.4-5 amperes at 6 volts with engine stopped.

Distributor Model IGC-4052. Breaker contacts separate .018-.020 inch. Set contact gap by loosening lock nut on stationary contact mounting stud and turning up stud until gap is .020 inch with breaker arm on lobe of cam. Resurface contacts when necessary with a fine flat contact file or on a medium hard oilstone. Breaker arm spring tension is 18-22 ounces. Distributor is semi-automatic. Maximum manual advance is 10 degrees (distributor). Automatic advance begins at 400 R.P.M. of engine. Maximum automatic advance is 11 degrees (distributor) reached at 3400 R.P.M. of engine.

Mounting:—Distributor is mounted on top of oil pump housing at right of engine. To remove distributor, disconnect primary lead and manual advance control and remove distributor head with cables intact. Then take out hold-down screw in advance arm and lift distributor from place.

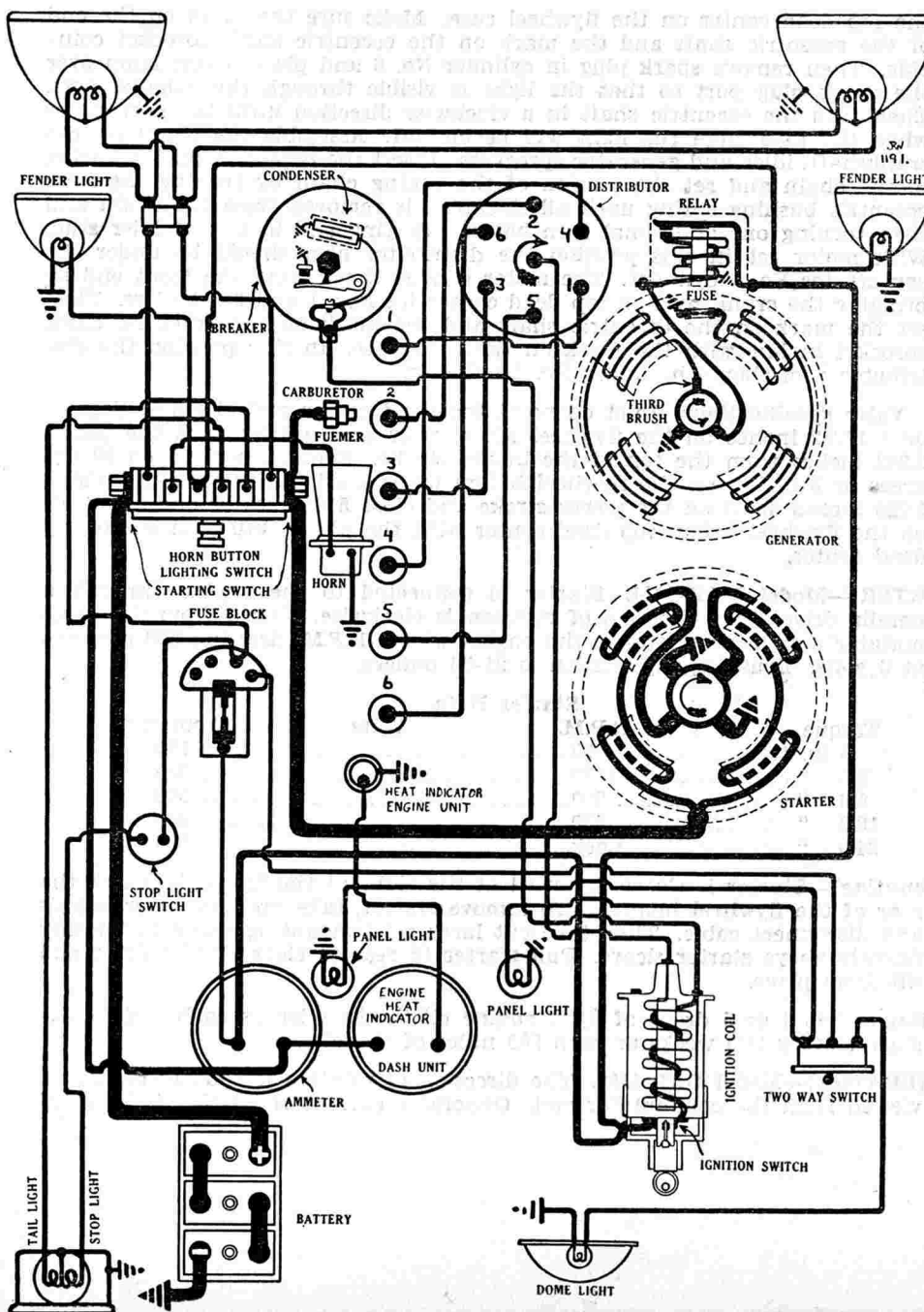
Oiling:—Fill the oiler on the side of the distributor shaft housing with light engine oil every week or each 250 miles. Every 1000 miles remove the distributor head and rotor and put several drops of oil in the wick oiler in the center of the shaft and one drop of oil on the breaker arm pivot pin. Every 5000 miles put a small bit of vaseline on the face of the breaker cam.

Timing:—Breaker contacts begin to open when the piston entering power stroke reaches a position .011 inch (actual piston travel) or 16 degrees (on the flywheel) before top dead center with the manual spark control fully advanced. To set timing, crank engine over until piston No. 1 enters compression stroke. This can be determined by taking out No. 1 spark plug and turning the engine over until the air compressed in the cylinder is felt escaping through the spark plug part. Fully advance the manual spark control (push the spark button all the way in toward the dash) and see that the distributor is turned counter-clockwise as far as possible. Turn engine over until the ignition mark on the flywheel 'IGN' which is 16 degrees before the top dead center mark 'T.C.' is directly opposite the indicator in the inspection hole in the flywheel housing. Take up all backlash in distributor gears by turning distributor shaft counter-clockwise. Then loosen advance arm clamp screw and rotate distributor until contacts begin to open. Tighten the clamp screw and connect spark plugs as shown on the diagram.

Firing Order:—The firing order is 1-5-3-6-2-4.

Spark Plugs:—Spark plugs are 7/8-18 S.A.E. Champion Type C-4. Gaps are .025 inch.

VALVE TIMING:—The Willys Knight engine is of the sleeve valve type. To time sleeve valves with eccentric shaft sprocket removed, remove pipe plug in exhaust manifold directly opposite No. 1 exhaust port and scrape carbon from edges of sleeve ports so that closing of ports can be checked. Remove



WILLYS KNIGHT

MODEL 66-D (1931) SERIAL NUMBERS 1001 UP

PRODUCTION STARTED DECEMBER 1930

AUTO-LITE GENERATING, STARTING SYSTEM

AUTO-LITE IGNITION

inspection hole cover in flywheel housing and turn engine over until piston No. 1 reaches top dead center with the flywheel mark 'T.C.' directly opposite the indicator. Remove the spark plug in cylinder No. 1 and place a test lamp in the spark plug port so that the light can be seen through the exhaust port. Then turn eccentric shaft in direction of rotation until the upper edge of the port in the outer sleeve just passes the lower edge of the port in the cylinder block when the light will be cut off. Assemble eccentric shaft sprocket and timing chain, being careful not to disturb relative positions of eccentric shaft and crankshaft.

Timing Specifications:—Inlet valve ports open 5 degrees after top dead center and close 46 degrees after lower dead center. Exhaust valve ports open 50 degrees before lower dead center and close at top dead center. The inlet opening and exhaust closing points for cylinder No. 1 are marked on the flywheel by the marks 'I.O.' and 'T.C.'

STARTER:—Model MAB-4018. Starter is connected to the engine through a Bendix drive. The direction of rotation is clockwise, viewed from the commutator end. Brush spring tension is 44-56 ounces. The starting switch is mounted at the lower end of the steering column and is operated by pulling up on the knob on the steering wheel.

Starter Data			
Torque	R.P.M.	Volts	Amperes
3.4 "	1100	5.0	200
.6 lb. ft.	1910	5.5	100
6.6 "	695	4.5	300
10.15 "	420	4.0	400
24 "	Lock	4.0	725

Mounting:—Starter is sleeve mounted at the right of the transmission on the rear face of the flywheel housing. To remove starter, disconnect cable and take out two dowel screws in flywheel housing directly above starter sleeve. Then pull starter to the rear to clear drive and lift from place.

Oiling:—Put 4 to 6 drops of light engine oil in the oiler at each end of the starter every two weeks or each 500 miles of operation.

GENERATOR:—Model GAG-4130. The direction of rotation is counter-clockwise, viewed from the commutator end. Generator current regulation is by third brush shunt field. To adjust generator output, remove the commutator cover band and shift the third brush by prying on the brush mounting stud with a screwdriver. Shift the third brush in a counter-clockwise

direction to increase the charging rate and in the opposite direction to decrease the charging rate. The brush is held in position by friction between the mounting stud and the end plate. With standard car setting, the maximum charging rate is 17 amperes at 8 volts reached at 1400 R.P.M. (cold).

Generator Data		
Amperes	Volts	R.P.M.
0	7.0	575
8	7.2	820
17	8.0	1400
12	7.6	2150

A 7.5 ampere capacity field fuse is connected in the field circuit. Shunt field current is 4.08-4.52 amperes at 6 volts. Generator, motoring, draws 4.18-4.62 amperes at 6 volts. Brush spring tension is 22-27 ounces.

Mounting:—Generator is cradle mounted at the right of the engine and is driven through a flexible coupling from the chain case. To remove generator, disconnect lead and drive coupling. Then loosen mounting strap and slide generator from place.

Oiling:—Put 4 or 5 drops of light engine oil in the oiler at each end of the generator every two weeks or each 500 miles of operation.

RELAY:—Model CB-4014. Relay is mounted on the generator field frame. Relay contacts close at 575 R.P.M. when the voltage of the generator reaches 7-7.5 volts and open with a discharge current of .5-2.5 amperes. Charging current at closing of contacts is approximately 2 amperes. Relay contact gap is .025-.035 inch. Air gap is .010-.030 inch with contacts closed.

LIGHTING:—Finger Tip Control Switch Model A-805. Switch is mounted at the lower end of the steering column and is controlled by a button on the steering wheel. The starting switch, lighting switch and horn button are incorporated in a single unit. Headlights are equipped with double filament bulbs. Headlights are 6-8 volt, 21-21 cp. D.C. Mazda 1110. Side lights or fender lights are 6-8 volt, 3 cp. S.C. Mazda 63. Dash light and dome light are each 6-8 volt, 3 cp. S.C. Mazda 63. Stop and tail lights are 6-8 volt, 21-2 cp. D.C. Mazda 1158. This is a double filament bulb and the tail light lead must be connected to the 2 cp. filament.

FUSES:—Generator field fuse is 7.5 ampere capacity. Lighting fuse mounted on fuse block on lower left front side of dash is 20 ampere capacity.